THE BRYGGEN PAPERS

Main Series No. 10

DATA-BASED RUNES

MACROSTUDIES ON THE BRYGGEN RUNIC INSCRIPTIONS

ELISABETH MARIA MAGIN

UNIVERSITY OF BERGEN

About the book

This volume of The Bryggen Papers focuses on the almost 700 runic inscriptions found over the course of the Bryggen excavations (1955-1979) in Bergen, Norway. The medieval inhabitants of Bergen inscribed runes onto a variety of materials: wooden sticks, bones, ceramics and even leather shoes. The topics they wrote about varied, ranging from religious invocations to vulgar descriptions of their fellow townspeople. Nor were these inscriptions static; it is possible to identify trends in the way inscriptions changed over time with the development of the medieval settlement, influenced by concurrent historical events. Information as to the potential geographic origins and social status of some of the carvers, who saw fit to record their names, can also be derived from the inscriptions.

This interdisciplinary study exemplifies how the theoretical framework of relational databases can be utilised to support in-depth comparisons of runic inscriptions. Rather than being a more traditional study of the content of the inscriptions, it assesses the suitability of different data models and demonstrates how relational database management systems can become powerful tools for conducting runological research, benefiting the broader field of runology and epigraphic studies in general. The study also makes use of the digital format by directly linking to other runic databases to supplement the information provided here.

The author

Elisabeth Maria Magin, PhD (b. 1987) has a Bachelor's and Master's degree in Proto- and Prehistoric Archaeology and Scandinavian Philology from the Georg-August-Universität Göttingen, Germany, and received her doctoral degree for her interdisciplinary thesis on the runic inscriptions from Bryggen at the School of English, University of Nottingham. She has taught Old Norse, medieval Scandinavian literature and runology at the universities of Bergen and Oslo, and worked for several years as an assistant on the edition of South Germanic runic inscriptions published in 2020. She is currently undertaking a MSCA (Marie Curie-Skłodowska Actions) project aiming to create the infrastructure for digital editions of runic inscriptions at the Museum of Cultural History, Oslo.

Author affiliation:
Elisabeth Maria Magin
Museum of Cultural History
Department of Archaeology
University of Oslo
Norway

THE BRYGGEN PAPERS

Main Series No. 10

THE BRYGGEN PAPERS

The Bryggen Papers book series is a flexible peer reviewed publication channel for research on the Middle Ages in Norway and its international context. The series is multi-disciplinary as well as cross-disciplinary and addresses the Middle Ages in a broad sense temporally and geographically. The Bryggen Papers series is published by The University Museum of Bergen and The Faculty of Humanities, University of Bergen and hosted by Bergen Open Access Publishing where all volumes are available in digital format.

Published in the Main Series

Vol. 1 (1984) Asbjørn E. Herteig: *The Archaeological Excavations at Bryggen, 'The German Wharf', in Bergen, 1955-68.* Arne Emil Christensen: *Boat Finds from Bryggen*
Vol. 2 (1988) Ingvild Øye: *Textile Equipment and its Working Environment, Bryggen in Bergen c 1150-1500*
Vol. 3 Part 1 (1990) Asbjørn E. Herteig: *The Buildings at Bryggen, Their Topograhical and Chronological Development*
Vol. 3 Part 2 (1991) Asbjørn E. Herteig: *The Buildings at Bryggen, Their Topographical and Chronological Development*
Vol. 4 (1992) Arne J. Larsen: *Footwear from the Gullskoen Area of Bryggen*
Vol. 5 (2004) Ole Mikal Olsen and Helge Sørheim: *Medieval Fishing Tackle from Bergen and Borgund*
Vol. 6 (2005) Gitte Hansen: *Bergen c 800-1170. The Emergence of a Town*
Vol. 7 (2007) Sigrid Samset Mygland: *Children in Medieval Bergen - an Archaeological Analysis of Child-related Artefacts*
Vol. 8 (2010) Ole Magne Nøttveit: *Sheaths and Scabbards from Medieval Bergen - In a Comparative Perspective*
No. 9 (2023) Sigrid Samset Mygland: *Women in Medieval Bergen - Gender and Material Culture*

Published in the Supplementary Series

No. 1 (1984) Studies on the Earliest Farm Settlement, the First Built-up Area along the Shore, Animal Hair Products, Coins, and Seal Jugs
No. 2 (1988) Presentation of Runic Inscriptions Found at Bryggen
No. 3 (1988) Brewing, Cordage Products, Sound Tools and Music
No. 4 (1989) The Bryggen Pottery 1
No. 5 (1994) The Bryggen Pottery 2
No. 6 (1998) Medieval Fires in Bergen – Revisited
No. 7 (2000) Ships and Commodities
No. 8 (2009) Osteoarchaeological Analyses From Medieval Bergen
No. 9 (2013) 'Small Things Forgotten'. Locks and Keys & Board Games

THE BRYGGEN PAPERS

Main Series

No. 10

DATA-BASED RUNES

MACROSTUDIES ON THE BRYGGEN RUNIC INSCRIPTIONS

Elisabeth Maria Magin

UNIVERSITY
OF BERGEN

Publisher

The University Museum of Bergen & The Faculty of Humanities, University of Bergen

ISBN 978-82-93904-02-1 (online)
ISSN 2704-0682 (online)
DOI: https://doi.org/10.15845/bryggen.v100

Inquiries about The Bryggen Papers can be directed to
Principal Contact: https://boap.uib.no/index.php/bryggen/about/contact

Photo cover

Adnan Icagic, University Museum of Bergen

Layout cover

Tine Erika Fuglseth, Bergen City Museum/ Christian Bakke, Communication Division, University of Bergen

Layout

Elisabeth Maria Magin, LaTeχ

Contents

Foreword

The editorial board of The Bryggen Papers series is proud to present The Bryggen Papers Main Series No. 10. This volume is the first to be published exclusively in online format, it is in Universal Design and available as open access from day one. The monograph is based on Elisabeth Magin's interdisciplinary doctoral thesis in archaeology, runology and digital humanities, submitted to the University of Nottingham, edited and updated after defence and peer-review. The Bryggen Papers was established during the 1970s the as the University of Bergen's scientific, international book series presenting the archaeological finds from the pioneering archaeological excavations at the German Wharf Bryggen in Bergen (1955-1979). The series had two strands: The Main Series for monographs, and The Supplementary Series for thematic anthologies. During the 1980s and 1990s the series expanded its profile thematically and geographically. Today The Bryggen Papers has merged the main series and the supplementary series into one expanded and flexible series and revised its focus and scope. The Bryggen Papers now aims to be the brand and name of a flexible non-commercial peer-reviewed book series for research on the Middle Ages. The profile is multi-disciplinary with focus on the Middle Ages in a broad sense, both chronologically and disciplinary. The Bryggen Papers publish full presentations of basic studies as well as general and interdisciplinary analyses, both in the format of monographs and anthologies.

The series is published by the University Museum of Bergen and the Faculty of Humanities, University of Bergen (UIB). The editorial board responsible for the publication of the series is appointed by the Faculty of Humanities, UIB, and consists of Professor Dr. Gitte Hansen, Department of Cultural History, University Museum of Bergen, UIB (Chief Editor); Researcher Dr. Irene Baug, The Medieval Research Cluster, Faculty of Humanities, UIB; Professor Dr. Visa Alexis Immonen Department of Archaeology, History, Cultural Studies and Religion, UIB; Senior Curator Dr. Sigrid Samset Mygland, Bryggens Museum Bergen City Museum and Associate Professor Dr. Jens Eike Schnall, Department of Linguistic, Literary and Aesthetic Studies, UIB. PhD candidate MA Brita Hope Department of Cultural History, University Museum of Bergen, UIB acts as editorial Staff.

Bergen October 2023

Gitte Hansen

Chief Editor

Acknowledgments

This volume of The Bryggen Papers is the first volume since 1988 dealing explicitly with the runic inscriptions discovered during the large Bryggen excavation (1955-1979), and as such, one might expect a thorough investigation of each single inscription from Bryggen, along the lines of what Liestøl & Johnsen (1980-1990) offer. Alas, like many disciplines, runology has changed since 1988 and runologists these days are confronted with challenges and questions far beyond what traditional runology does. One of these challenges concerns the increasing use of digital tools for research, whether in the form of archaeological object databases or text encoding for medieval manuscripts. Runologists these days use and rely on these tools for their research just like other scholars do; and as this volume will show, attempts have been made to make use of digital tools specifically for runological research. However, as experience has shown, it is by no means an easy task to use computers and digital tools in runological research.

This is a fact I learnt the hard way while assisting Klaus Düwel in his work on the new edition of South-Germanic runic inscriptions (Düwel, Nedoma & Oehrl 2020). Between 2009 and 2015, I was his Wissenschaftliche Hilfskraft (student assistant) and the person responsible for translating between what Herr Düwel wanted and what the computer could do, a job that turned out to be complex considering Klaus Düwel himself still wrote everything by hand and often struggled with understanding the limitations of the machine. It was a challenge to explain why the computer was able to find hundreds of articles on any given topic in the university library, but could not turn a rune by 180° in Microsoft Word; and anyone who has met Klaus Düwel will know that "because it's not possible" was generally not considered a sufficient answer. It fell to me to provide the required technical explanations to satisfy his curiosity and figure out solutions to the seemingly endless issues arising from this meeting of man and machine; a constant challenge which was the driving force behind my thesis and the source of my interest in just why it is so difficult to do "Digital Humanities", and do it well.

The thesis in question was called "Runes, runic inscriptions and runic writing as primary sources for town development", written and submitted under the supervision of Professor Judith Jesch (School of English), Assistant Professor Christopher King (Department of Archaeology) and Professor Gitte Hansen (Bergen University Museum), at the Universities of Nottingham and Bergen, respectively, between 2015 and 2020, with funding from the (then) Midlands3Cities Doctoral Training Programme and Diku – Norwegian Agency for International Cooperation via Mobility Grant for Norwegian Language and Literature.

Presented in this volume of The Bryggen Papers is an edited and extended monograph based on the original thesis, where comments from reviewers and other scholars have been worked in. I have also permitted myself to include several – what I hope to be – improvements on the text itself, for example where the original word count prevented me from delving deeper into a certain aspect. I am grateful to the editors of the series for all of their work they have put into the monograph version and for including my work in The Bryggen Papers.

I would also like to thank my supervisors for their support over the five years of writing the original thesis, in the form of discussions, critique, access to collections, signing off on ridiculously many forms and a lot of patience considering they had to deal with a rather stubborn student, who would disappear from the country for months and developed a habit of dislocating limbs.

There is a plethora of others I also wish to thank. When disappearing to Norway, I could be sure of a warm welcome at Bryggens museum, Bergen, and to everyone there a heartfelt thanks for help, support and lunsj, which I am afraid I still prefer on the sweet side. Furthermore, I wish to thank Ruarigh Dale, James Knirk, Kristel Zilmer, Martin Findell, Sigrid Samset Mygland and Sigmund Oehrl, who contributed in various ways, and Terje Spurkland and Knut Helle, who I regret not being able to show the finished result to.

Fellow students from C27, LG31, neighbouring offices and offices in other cities/countries were a greatly appreciated source of support, in particular James Aitcheson, Sam Rosen, Andreas Schmidt, Lance Pursey, Andreas Fischnaller and Monica Enehaug; Sven Martin Kraus, Ingrid Marie Heiene and Balduin Landolt provided valuable in-depth discussion about digital methodology and also a great team to work with for our COVID-crisis digital symposia on Digital Humanities. Further digital help was provided by Erin Snyder, Teri Browett, Stacey Hassall-Jones, Doug Cooper and especially Richard Tyler-Jones, whom I cannot thank enough for making sure the digital side of this thesis was appropriately presented. Remaining errors are entirely my fault.

Friends and house-mates provided emotional support and in some cases a place to stay during travels; Saskia, Hannah, Linnéa, Hannah Eins, Vivien, Aigerim, Diana, Tolganay, Guldana, Annelie, Laila, Katharina and Julia, I am very grateful I had you all at my back.

My family, too, put up with me remarkably well, especially when I was incapacitated and on mandatory, yet very much involuntary health leave, and I would like to thank my parents especially for not only always encouraging me to seek out new horizons, but providing a safe haven when living between three countries got a bit much. I'm equally grateful for Andrew, who struggles to share my fascination, but continues to patiently listen to my monologues about Venn diagrams and databases.

At the start of it all, however, stood Klaus Düwel, whose curiosity gave me reason to explore topics I would otherwise likely never have touched. He was mentor, colleague and honorary grandfather, but maybe most importantly, a firm believer that whichever technical problem there was, I could figure out how to solve it. If there was anyone who could rightfully claim that this book wouldn't exist without them, it was him, and it is my great regret that I can only posthumously dedicate it to him, in deep gratitude and fond memory.

Oslo October 2023

Elisabeth Magin

1 Introduction

The work presented here sits at the intersection between runology, archaeology and Digital Humanities. Its aim was to develop a basic model for a runological relational database (DB) and test its usefulness by means of running large-scale analyses on onomastic, textual and archaeological aspects of the Bryggen runic corpus.[1] These inscriptions, counting at present 677 proper or suspected inscribed objects, make up the largest comprehensive corpus of runic inscriptions in the world. They were discovered in the course of a series of archaeological excavations begun after a fire on the 4th of July, 1955, destroyed four house rows in the old Hanseatic quarter Bryggen in Bergen, Norway. They date between approximately 1100 and 1450; written in the medieval Futhark, they are carved into objects of daily use or specially cut wooden sticks with several flat sides carrying the runes. The texts are of a varied nature, from lewd insults to expressions of personal feelings to business correspondence (Düwel 2008: 156-158).

The Bryggen runic inscriptions, named for their town quarter of discovery, are only a few of more than 300,000 finds on the Bryggen 1955-1979 (BRM 0-site) and a further 300,000 finds from subsequent excavation sites. The items found are today owned and curated by the University Museum of Bergen, University of Bergen, on behalf of the Norwegian state, with the runic inscriptions in addition being the responsibility of the Runic Archives at the Kulturhistorisk museum (Museum of Cultural History), University of Oslo. By virtue of the materials discovered and the excellent preservation conditions especially for wooden objects, the archaeological sources have permitted scholars to examine the development of the town, called Bjǫrgvin during this time, in almost unprecedented detail. To this day, archaeologists have looked at items of daily life like fishing gear, shoes, jewellery, textile equipment, children's toys (Olsen 2004; Larsen 1992; Molaug 1998; Øye 1988; Mygland 2007; Hansen 2005a), the town structures (mainly Herteig 1990, 1991; Hansen 2005a) and transport (Christensen 1985). As far as the runic inscriptions are concerned, focus was for the most part on establishing reliable transrunifications, transliterations and normalisations (for example, but not limited to Seim 1988; Liestøl & Johnsen 1980-1990), leaving several hundred unpublished (Zilmer 2020: 66-68).

Published and unpublished runic inscriptions, however, present unique opportunities for conducting comparative analyses in a discipline usually not in any position to be analysing large corpora of data. The onomastic material from these inscriptions alone, which has from the start drawn attention (Chapter 5), can be used to gain insight into the composition of Bjǫrgvin's rune-carving population, whereas the variety of different text types in the inscriptions permits glimpses at the topics and concerns the rune-carvers had.

Yet data mining, or bulk analysis, are not typical approaches in runology. A corpus of the Bryggen size is also very difficult to analyse as a whole, especially when several inscriptions have not yet been interpreted or published, not to mention that reinterpreting 677 inscriptions over the course of a PhD project like the one this publication is based on is impossible. With technical support, however, new avenues of research open up. This project is inspired by the emergence of runic DBs since the late 1980s, meant to help and further research by making information about inscriptions more easily and widely accessible, to the academic runologist community and the interested public. It was undertaken with the specific goal in mind to examine how runologists have been using DBs so far, and to identify areas where existing models could be enhanced by, for example, different data modelling and thus, rendered more useful for research purposes, including conducting the kind of macro-analyses usually connected to words like "big data".

The aim was to serve two purposes: one, to see what information can be gained from approaching the Bryggen inscriptions as a corpus and taking a macro-perspective rather than conducting micro-analyses on single inscriptions; two, evaluating the use of a specific technology for these analyses. The wealth of names appearing in these inscriptions as

[1] Throughout the text, coloured words/expressions indicate clickable hyperlinked entries. Clicking on them will either lead to a jump within the document to, for example, the chapter, page or index entry referenced, or open a website.

well as their textual variety and the archaeological data available makes the Bryggen inscriptions an ideal case study on which to develop and test a relational DB model.

However, no tool should be used without knowing how it is used; that also applies to digital tools. The technical aspects of the underlying technology are therefore paid equal attention as the research outcomes, and the groundwork for understanding how the tool is used for research purposes is laid in Chapter 2. Focus then shifts to a possible solution to the problem of representing runes and their variations adequately in a DB (Chapter 3). In Chapter 4, the process of deciphering a runic inscription is translated into a suitable data model, which forms the core database, a model of a runic DB designed as the basic stepping stone for many different research projects and applicable to runic inscriptions beyond the Bryggen corpus.

From there on, chapters are divided into two parts: one part focuses on the actual work of the runologist, the other on how these steps can be adequately modelled in a DB. Chapters 5 to 7 show how, using the core database as a jumping-off point, a research database focusing on the onomastic, textual and archaeological aspects of the Bryggen inscriptions can be designed and used to examine these different aspects in relation to each other on a large scale. To enable other scholars to test the final DB model, Take Runes (TAKERUN), chapters and appendices include documentation in the form of queries and discussions of why each decision was made at each stage of data modelling.[2] Particular attention is also paid to what is actually being modelled.

Scholarly DBs are mostly created not only to store data, but in order to answer research questions. Due to the nature of the data, they are, however, often much more complex than generic DBs for e.g. customer management. It is tempting to expect that a scholarly DB will be able to do more than simply store and process data – that it will be able to provide "answers". When DBs, in particular relational DBs, are used for research purposes, the definition of "data" however, must shift. Data does not provide answers, neither is it "truth", even if it is "facts". It is the scholar's or scientist's interpretation of the data that provides the "answer" and as the discussions here show, for a runological DB, it is less important to store "facts" than it is to store prior research. Consequently, the model developed here attempts to provide solutions for how prior research, with all its vagaries and conflicting opinions, can be stored and queried in a relational DB.

[2] Some tables in the text use A3 paper if printed out, while tables too long for the text are printed in Appendix B.

2 Digital Humanities approaches in runology

Constantly evaluating the tool/technology in regard to a specific application is not normally done in either runological or archaeological publications; the tool is used to analyse material, but as a tool, it is of no particular interest. By making it the focus of attention, the original project sat as much within the field of Digital Humanities as within runology or archaeology. This field is comparatively young, although using machines to study subjects traditionally located within the Humanities dates back as far as the 1940s. With the advances of technology in the following decades, subjects and approaches became more diverse (Hockey 2004; Hayler & Griffin 2016a).

The term, too, has changed: from "Humanities Computing" ("the automation of every possible analysis of human expression", Busa 2004: xvi) to "Digital Humanities", which encompasses more than simply the automation of analysis, although a commonly agreed-upon definition is still being debated. This is not least owing to computers/applications today being used in many projects as a convenient means for cumbersome and time-consuming tasks (writing publications in word processing applications, storing literature references in bespoke literature DB, and more). However, that does not automatically make such projects "Digital Humanities". Rather Digital Humanities are about how the digital side of the equation interacts with the humanities side. The resulting clashes, interferences, problems and benefits are an important field of study by themselves. Express attention is therefore not only paid to the products of digitisation and digital research, but to the processes involved in creating them, since "digital building is a research method which will produce its own distinct insights" (Hayler & Griffin 2016a: 11). In other words, digitisation of traditional humanities material (texts, music, art, objects) has to be treated as a scholarly approach to the material in question; distinct from non-computerised methods, but with its own theoretical foundations.

One of the most crucial Digital Humanities premises is that theoretical concerns are already inherent in the act of digitisation. It is never "neutral", but always relies on preconceived notions and assumptions, which, if not explicitly addressed during the process, will later need to be brought to light by studying the end product (Hayler & Griffin 2016a: 2, 11). There is no such thing as "I'll quickly put together a DB." Every step of the process requires decisions in favour of one solution to the detriment of other ways of doing it, which in turn impacts on what can be "done" with the resulting digital "thing".

Amongst those working in the broad field of Digital Humanities, the concept that the tool influences the end product is something of a truism (see for example Unsworth, Siemens & Schreibman 2004; Hayler & Griffin 2016b). Therefore, reflection on how the tool shapes and influences the information (to be) digitised is important, and the lack of neutrality in the supposedly objective process of digitisation is an area of research and discussion. It begins with the choice of materials to be digitised, up to and including the choice of tool for data management (Tanner et al. 2016). While the first is often still a recognisably humanities discussion (what part of a collection should be digitised, what political/ethical concerns must be taken into account), the latter is frequently situated in the somewhat vague territory of interdisciplinary work. In practice, this means intense reflection of how different tools enable or restrict certain kinds of planned analysis for "by its very nature, humanities computing has had to embrace 'the two cultures', to bring the rigor and systematic unambiguous procedural methodologies characteristic of the sciences to address problems within the humanities that had hitherto been most often treated in a serendipitous fashion" (Hockey 2004: 3).

The differences between the two approaches may result in scholars ignoring one or the other aspect. Hayler & Griffin (2016a: 3-4) point out that the tendency is to ignore the technical aspects, which in turn results in a problem when working with digitised materials. While computers were built to manipulate numbers representing symbols, the human user's ability to do something with the output is restricted and influenced by how the computer processes the data (Laue 2004: 145, 151). When

"[...] tools co-determine their products and the thinking of their users [...]" (Hayler & Griffin 2016a: 5), not taking into account these constraints diminishes the value of any insights won by using a digital tool for research.

While knowing how a computer works is not required to use it, when engaging in Digital Humanities projects, it is wise to familiarise oneself with the basics of machine and tool alike (Deegan & Tanner 2004: 502). The most important factor to keep in mind is probably that computers are machines processing numerical data by performing mathematical operations on it. The data inside a computer is stored in bits, electronic impulses set to either "on" or "off" (commonly interpreted as 1 or 0), and data is changed by changing the state from "on" to "off" or vice-versa. Long strings of combinations of "on" and "off" represent different pieces of data; a Roman letter for example needs eight bits (8 times on/off = 8 bits = 1 byte) (Deegan & Tanner 2004: 490). On occasion, people argue against using computers for certain tasks, quoting their inflexibility in dealing with the vagaries of humanistic data. Using binary for storing information, however, does not mean that the data stored by these means has to be unambiguous. The solutions presented here are explicitly designed to appropriately store and represent ambiguities inherent in runic inscriptions with the help of a relational DB.

So the tools/technologies used to digitise, curate and retrieve information we use for research deserve as much attention as the hypotheses and theories we reference (see for example Schreibman, Siemens & Unsworth 2004: xxv). Moreover, since these tools/technologies in many cases literally shape the information in a certain fashion, close attention needs to be paid to how the tool impacts on the data; otherwise, it is too easy to forget the limits of interpretation applied to the results. Runology-adjacent, historical linguistics provide examples. Rendering historical documents machine-readable is a laborious process requiring a lot of decision-making, especially when the text is not only to be rekeyed, but also to be marked up for in-depth linguistic analyses (Deegan & Tanner 2004). The final digital product can only be used meaningfully when users are aware of what went in and how, not only what came out.

The appropriate choice of tool/technology is therefore crucial in any digitisation endeavour, and it should be evaluated during the process to ensure that the ways in which it impacts on the shape of the final product are properly understood. The process of "making", i.e. the modelling of data according to the underlying principles of Relational Database Management System (RDBMS) is therefore made explicit and transparent here by connecting each modelling decision to the equivalent step in the process of analysing and interpreting a runic inscription. To achieve this link, the possibilities and limitations of the tool on the one hand and the expectations and processes of traditional runologist work on the other need to be examined.

2.1 Databases and (Relational) Database Management Systems

As their name indicates, Database Management Systems (DBMSs) were developed in order to manage data. Yet while DBMS manage DBs, they are not the same as a DB, and should not be understood as such, although it is a widespread misuse of the term. A DB is defined as "a logically coherent collection of data with some inherent meaning" (Elmasri & Navathe 2017: 35). The term "related" in this case refers to the fact that all data in a DB should concern a particular topic: "[t]he purpose of a database is to store information about a particular *domain* (sometimes called the *universe of discourse*) and to allow one to ask questions about the state of that domain" (Ramsay 2004: 179). In other words, every bit of data in the DB should be relevant to the questions one wishes to ask.

It is crucial to understand that such questions are "answered" by way of different sets of data being retrieved as required by using the DBMS. This is the software, often including a Graphical User Interface (GUI), providing the means for users to interact with the data in the DB and delivering the data to be interpreted by the user in an easy-to-work-with visual form. Both spreadsheet applications and DBMS are used for storage, retrieval and analysis of data. They differ in how the data is structured, but both often present data to the user in a tabular format. This can cause confusion, especially because spreadsheets are, on occasion, also referred to as DBs. Yet spreadsheets store data in a single, consistently organised structure, where the same piece of data is often stored multiple times; this is called "data redundancy" (Ramsay 2004: 180, with examples on how to turn a single spreadsheet into a proper relational DB). DBMS, however, store data in multiple structures organised according to certain principles. For instance, RDBMS require data to be stored in "relations", structured according to principles originally devised by E.F. Codd (Laue 2004: 179) and broadly based on Set Theory and Relational Algebra.

To illustrate, if one were to use a spreadsheet to store runic inscriptions, it might look like Tables 1 and 2. Since the internal logic of the spreadsheet demands that every row and column be dedicated to one piece of information, trying to input all possible transliterations, translations and interpretations of a runic inscription results in a spreadsheet with a lot of empty spaces and/or a lot of doubled and tripled entries (Table 1). This in turn negatively affects the application's ability to conduct analyses or even simple filtering functions. Using one single row for one inscription and adding all relevant information into the following columns is equally impractical and even less conducive to comparing data within one column, let alone different columns (Table 2). Either way, spreadsheets of this kind are impractical to work with.

The data in a relational DB, the most prevalent model used in the humanities (Hockey 2004: 9), are structured broadly as sets or "entity types", with data broken up into smaller sets. Importantly, no relationships between entity types are explicitly declared. However, relationships can be created based on matching (joining) data values in entity types. Thus the way entity types can connect to each other represents what Ramsay (2004: 195) calls "an entire set of ontological relations capable of generating statements about a domain." In a nutshell, entity types in a relational DB are structured to reflect aspects of reality. They are used in the humanities because of their ability to create *meaningful* links between data containing information about how one part of reality interacts with another, for example authors, books and publishers (Ramsay 2004: in particular 178). This makes them vastly more powerful than a simple spreadsheet, although perhaps more confusing for new users, since the process of breaking up data into entity types can be difficult; it requires a deep and clear understanding of the entities contained in the data and how they interact (although these interactions can, of course, be defined in different ways). Moreover, it is uncommon for users to always see all of the data within the DB displayed on the screen. Instead, users of RDBMS work with subsets of data retrieved from the data bulk and created as bespoke data sets for the aspects users want to investigate.

Such subsets are created by using specific commands, written in programming languages developed for the purpose of manipulating, (re-)organising, sorting, filtering, retrieving and analysing data. Since users have to specify which pieces of information they want, and in the process also have to specify which other pieces of information they relate to and how, Ramsay (2004: 178) considers the relational model to offer

> [...] the possibility not merely of an increased ability to store and retrieve information, but of an increased critical and methodological self-awareness. If the database allows one to home in on a fact or relationship quickly, it likewise enables the serendipitous connection to come forth. Relational databases in humanistic study are, in this sense, not so much pre-interpretative mechanisms as para-interpretative formations.

The most common language currently used by RDBMS is called Structured Query Language (SQL). Its basic commands can be expressed using a vocabulary of around 40 words (w3schools 2020). These principle statements enable the management (creation, modification, deletion) of data structures and the management of data (input, update, delete, retrieve). SQL is a very powerful tool for data administration with various RDBMS like Microsoft Access, MySQL or Oracle relying on it, although its use may vary slightly between applications. While different RDBMS store data in different ways and are therefore not compatible with each other, by using the same query language, data can still be shared between them.

<table>
<tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th></tr>
<tr><td>1</td><td rowspan="10">Inscription</td><td rowspan="4">Transliteration A</td><td rowspan="2">Translation 1 of A</td><td>Interpretation 1 of A1</td></tr>
<tr><td>2</td><td>Interpretation 2 of A1</td></tr>
<tr><td>3</td><td rowspan="2">Translation 2 of A</td><td>Interpretation 1 of A2</td></tr>
<tr><td>4</td><td>Interpretation 2 of A2</td></tr>
<tr><td>5</td><td rowspan="3">Transliteration B</td><td>Translation 1 of B</td><td>Interpretation 1 of B1</td></tr>
<tr><td>6</td><td rowspan="2">Translation 2 of B</td><td>Interpretation 1 of B2</td></tr>
<tr><td>7</td><td>Interpretation 2 of B2</td></tr>
<tr><td>8</td><td rowspan="3">Transliteration C</td><td>Translation 1 of C</td><td>Interpretation 1 of C1</td></tr>
<tr><td>9</td><td>Translation 2 of C</td><td rowspan="2">Interpretation 1 of C2 + C3</td></tr>
<tr><td>10</td><td>Translation 3 of C</td></tr>
</table>

Table 1. *Spreadsheet containing different readings and interpretations of a runic inscription, stacked vertically. Multiple cells have been combined into one big cell spanning several rows, meaning that the data in the big cell would be replicated in every single small cell, creating redundancy.*

	A	B	C	D	E	F	G
1	Inscription	Transliteration	Translation	Interpretation	Transliteration	Translation	Interpretation
2	A	A1	A1.1	A1.1.1	A2	A2.1	A2.1.1
3	B	B1	B1.1	B1.1.1	B2	B2.1	B2.1.1
4	C	C1	C1.1	C1.1.1	C2	C2.1	C2.1.1
5	D	D1	D1.1	D1.1.1	D2	D2.1	D2.1.1
6	E	E1	E1.1	E1.1.1	E2	E2.1	E2.1.1

Table 2. *Spreadsheet containing different readings and interpretations of a runic inscription, stacked horizontally. The redundancy is created by having more than one column storing transliterations, translations and interpretations.*

The storage of data in different relations (tables), which can be combined as the user wishes, renders DBs and RDBMS extremely flexible, capable of accommodating different types and sets of data and fairly easy to use. It is, however, especially their ability to mirror relationships which makes them relevant for the Humanities, here for the storage of runological data. Furthermore, the possibility to combine different sets of data into new subsets, which can then be analysed, permits a much wider range of possible analyses and therefore, research questions. It is thus no surprise that there have already been attempts at creating runic DBs, with the oldest being Samnordisk Runtextdatabas (Rundatabas) in 1987 (Owe 2014). These DBs and the premises they were built upon are now discussed.

2.2 Use of databases in runology so far

Previous runic DBs, based to different extents on the relational model, provide valuable information. Examination of how the DBs are structured exposes what data runologists consider important and suggest some of the assumptions used in modelling the data. Düwel (2008: 16) offers the following, very comprehensive list of aspects considered vital to the interpretation of runic inscriptions, dividing them into two categories, script-internal (*innerschriftlich*) and script-external (*außerschriftlich*). The latter can again be divided into two categories, *observations on the inscription* and *broader cultural context*:

Script-internal considerations (philological-linguistic analysis) aim to create a coherent, linguistically conclusive interpretation taking into account:

- inscription content
- linguistic/textual purpose
- universal, typological and language-specific rules
- communicative situation/type of communication (human-human or human-supernatural)

Script-external considerations: Observations on the inscription serve to establish the potential purpose by drawing conclusions from where on an artefact it has been carved:

- type of object
- relationship between the inscription and its carrier (visible or invisible when worn, on object itself or on a part later attached?)
- degree of wear-and-tear damage (the same or different for object and runes?)
- characteristic "writing" style

Script-external considerations: Considering the broader cultural context from which an inscription originated to establish a framework for what it may have meant and been used for by the original carver-/owner. Essential considerations of the type of artefact and the uses it may have been put to.

- for loose objects: provenance, potential transport route(s) to find spot, use, type of deposition (accidental/purposeful), circumstances of discovery (*in situ*/secondary, inhumation/cremation)
- for stationary objects: location and potential removal to a different spot, position (standing up/lying down) and changes thereof, single monument or part of a group, surrounding landscape, connection to other archaeological monuments such as burial(s) (grounds) or deposits

This list does not immediately translate into processable data, though, much less entity types. A closer examination of what specific kinds of data are represented by these different categories is therefore in order; the details and practicalities of how they can be structured for use in an RDBMS are discussed in Chapter 4. There is an important distinction to be made, however, and it has to be emphasised at this point that "processable data" does not include the scholar's background of knowledge, i.e. knowledge about the time period in question, social structures during this time, religious aspects of the culture and so on. For this reason, some aspects of what Düwel refers to as "broader cultural context" are not generally part of the information included in DBs. "Processable data" instead refers to basic information; within the sciences, data gathered for analysis is often simple and unambiguous, like measurements. The same is not the case in runology, where the information available always carries uncertainties. Therefore "data" should, in this instance, be understood as "a piece of information relating to the inscription", with the information being very hands-on and practical.[1] This in turn is rooted in what DBs/DBMSs

[1] Instead of "data", the term "capta" has been suggested (see the discussion in Nygren et al. 2016: 63); I cannot see the benefit of using a different term provided a clear definition of what "data" constitutes in any given circumstance is available. An interpretation is no less "data" than the physical dimensions of an object and can be equally subject to discussion concerning reliability and correctness. This is especially the case when talking about archaeological artefacts made of organic substances like leather, which can and will change size depending on conservation method. Such inherent difficulties need to be made explicit, it is not enough to simply call them by another name and assume this clarifies how precisely this piece of data is subject to certain circumstances.

can provide for scholars: not answers to research questions, but sets of data for scholars to interpret.

Script-internal considerations rely on the actual text of an inscription. The data required therefore consists of the text, either in runes, Roman letters and/or in the form of visual documentation. The whole process including a more in-depth discussion of each step is presented in Sections 3.2 and 3.4.5 and chapter 4; here a short overview will suffice:

A representation in standardised runes is desirable; here, the process of transcribing the actual rune on an object into a standardised version is referred to as transrunification. This expression was chosen to avoid confusion, as the term "transcription" is used differently in English and German. Equally desirable is a "translation" of the runes into Roman letters, called transliteration (Section 3.4.5). Based on this, the inscription content can be further specified as words – the spelling of which is then adjusted according to scholarly traditions in a normalisation –, phrases and sentences indicating a linguistic/textual purpose and a communicative situation.

Script-external considerations are, in part, based on observations and cover every piece of information relating to inscribed objects themselves. While Düwel (2008: 16) mentions type of object, possible provenance, usage, type of deposition as belonging to the broader cultural context, these pieces of information are still processable data, since they do not require a description of complicated cultural history. (An aspect of script-external information not easily stored is the transport route, as it relies on other types of information, like the possible provenance of an object versus its find spot. Theoretically this information can still be processed, but it is not the same type as the two pieces of information it relies on; it is a secondary type of data, reliant on what is already known/can be inferred.) Script-external considerations can be regarded as the kind of information an archaeologist will provide on a find: location, find circumstances, object classifications and dating, be that typological or by other means. A dating can also be derived on the basis of script-internal considerations, and of course every method of dating can produce different results.

Lastly, good data management demands that no piece of information be offered without at the same time quoting its source; a proper runic DB should not only note whence a piece of information originally came, but also which changes to the data were made at which point in time.

This short survey of the information required by runologists provides one part of the equation; the other side is how the data will be structured and stored in the tool. Between user and tool, however, there is the Graphical User Interface (GUI). As explained above, a DB is a collection of related data, which in the case of relational DBs is stored as relations. The interactions between user and data are handled by the DBMS, which will, for instance, handle storage, while presenting the data to users in a chosen format. Often, the interactions provided by the DBMS include a GUI and the choice thereof can decide whether the tool will actually be used; text-based commands on a simple terminal with operating system (OS)-prompts do not appeal to most end users. The criteria I will be looking at when discussing and assessing already existing runic DBs are therefore:

- how much and which information is available about the inscription itself (transrunification, transliteration, transcription/normalisation (including variations thereof), translations into different languages, editions, literature published on the inscription)
- what information about the context of an inscription is made available (archaeological and otherwise)
- data structure and user interface
- search functionality
- export functionality

Currently there are four scholarly DBs of runic inscriptions, Samnordisk Runtextdatabas (Rundatabas) (1987), Runer fra Bryggen (RFB) (1993/94), Kieler Runendatenbank (KDB) (approximately 1998) and RunesDB (online since 2018). Most of these projects were conceived and begun during the time when personal computers were becoming more common and software more accessible to non-specialists. It is worth noting as well that all of the projects appear to be aware of the

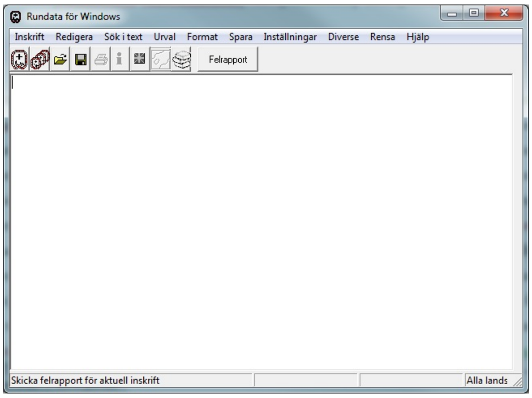


Figure 1. *Rundatabas, GUI*

relational model, which by this point in time had been around for about three decades, having first been presented by E.F. Codd at IBM in 1970. However, examining their structure and the way these DBs modelled their contents, it is also apparent that they do not follow the underlying principles for relational DB design and can therefore also not exploit the full flexibility of RDBMS.

2.2.1 Samnordisk runtextdatabas (Rundatabas)

Launched on January 1st, 1993, but based on an earlier MSDOS-project from 1987 (Uppsala runforum 2018; Owe 2014), the Rundatabas project aimed to digitally collect all Nordic runic inscriptions, including those found outside of Scandinavia, to permit and benefit research from a variety of disciplines (Peterson 1994: 305). As such, it was meant to provide a key to published corpus editions. Every inscription is presented in transliteration, normalisation and translation into English, except for 22 entries in Norwegian (Uppsala runforum 2014). The DB also provides information on dating, find circumstances, location (coordinates), object type, links to pictures and literature references, thereby fulfilling several of the above-mentioned criteria (see Table 3, page 36; Peterson 1994: 306-308).

Via its own application (Figure 1, Windows-only), downloadable to personal computers, users can query the data (Figures 2 and 3) and export it to various formats. The Graphical User Interface (GUI) also provides a "Help" section with an introduction on how to use the interface, i.e. how different searches can be run (e.g. in case one does not know the signum of an inscription, which is the main point of reference for searches), and where users can also look up how to insert special characters common in Old West Norse (OWN) writing like ð, þ or æ.[2] Help section and interface are available in Swedish and English. However, actually setting up a search within the user interface is quite difficult, even with the search criteria being organised in several drop-down menus. There are also a number of factors to be taken into account due to how the DB is structured. Underlying Rundatabas are six main files, four of which concern script-internal information (RUNDATA.RUN, RUNDATA.NFS, RUNDATA.FVN, RUNDATA.ENG). RUNDATA.RUN contains transliterations, whereas the next two contain a normalisation into the language spoken in the area at the time of inscription creation (NFS) and into normalised OWN (FVN). RUNDATA.ENG contains translations into English. RUNDATA.INF and RUNDATA.LIT contain script-external information, e.g. type of object, find spot, literature references (Table 3). While these files do not have extensions that computers immediately recognise, they can be opened in a text editor (Notepad(++), Kate) or even a spreadsheet application (Excel, LibreOffice Calc) without difficulty. The information in these files appears to be linked via the inscription signum (which can in this instance be called a primary key (PK), cf. Section 4.6.4), meaning that whenever a search is run, the DBMS collects information on the inscription from all files based on the signum and presents it to the user in the interface.[3]

The details of how data can be retrieved via this interface is beyond the scope of discussion at this stage, but explained well in the Help section. The DBMS can do some of the tasks outlined in Section 2.1, but it appears the main aim has been to

[2] The character codes are erroneously referred to as ASCII-codes. The code point they are referring to is in fact the Unicode Decimal code, as neither ð nor þ were encoded in the official ASCII character map (*ASCII Codes CP 865 (Nordic languages)* 2018), cf. Section 3.3.1.

[3] Except for literature references, which link to a file with explanations of what the abbreviations mean. Literature references for a single inscription link to a website.

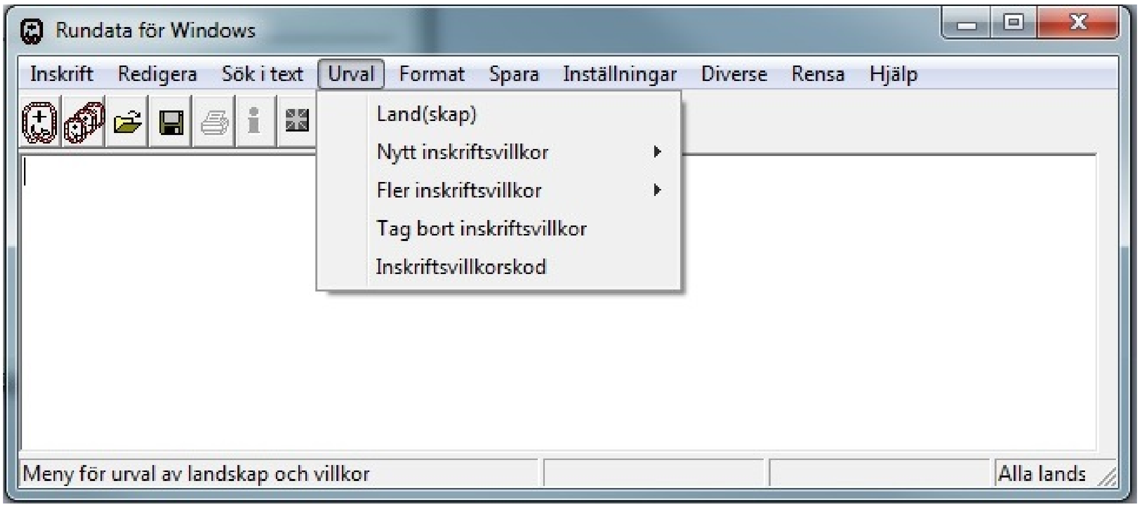


Figure 2. Querying for specific criteria in Rundatabas.

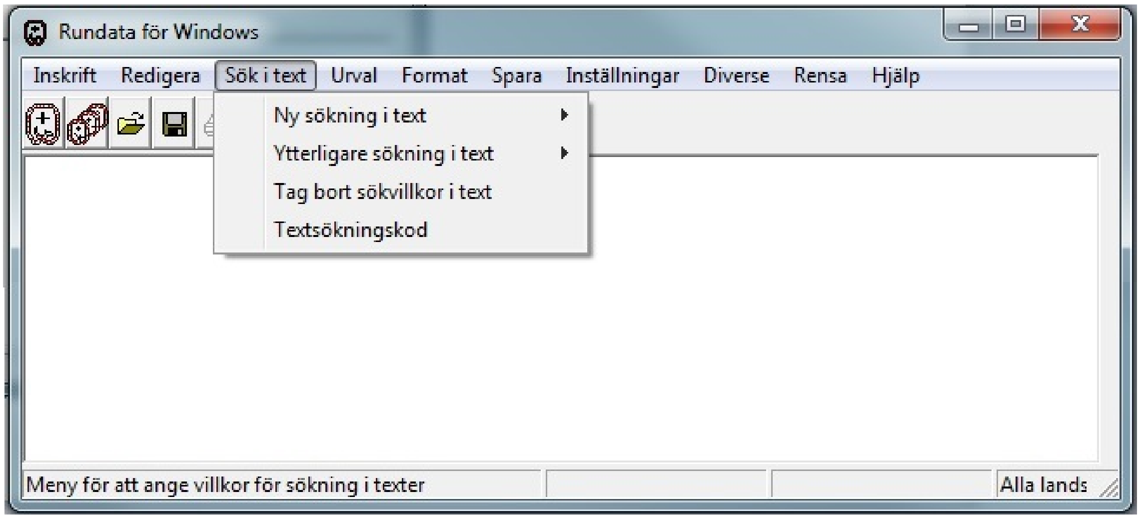


Figure 3. Querying in the inscription text in Rundatabas.

N 288 M	uikigr-
N 289 M	�A (t)rotin^n : um a^lla : fram � o^k �u styrk : mik : til a^l^lra go^
N 290 M	�A � rani � �B fu�orkhniast
N 291 M	�A hagon r�ist mig o^g en su�inen a mig �B ba^r� a m�(g)
N 292 M	fu�o
N 293 M	�A isakr �or(e)-r a mik i ro^ni �B -- �C isakr �D fu�orkhnisa
N 294 M	fu�or

Figure 4. Characters in an exported .csv-file from Rundatabas having turned into question marks upon being opened with the wrong character encoding.

enable filtering data in search of inscriptions answering certain criteria (Peterson 1994: 307-308). Updating or deleting data is impossible as long as one stays out of the underlying files (which is almost certainly the intention). Rundatabas does the filtering part well, however the mechanisms of setting the criteria are not easily understood by users without generic knowledge of retrieving data or runic inscriptions. Setting several criteria and combining them involves using at least two drop-down menus and keeping in mind how these criteria may limit the results (Figures 2 and 3). Rundatabas was created using the programming language Pascal (pers. comm. Marcus Smith, Riksantikvarieämbetet) and is therefore not using any of the current query languages, making it very difficult to use the data in another DBMS. While sophisticated querying is possible with this language (e.g. filtering for inscriptions from one region, containing specific words, using wildcards, searching for specific characters), each single query has to be run by itself, with the next one stacked on top of the result set. There are also other complications involved; to receive all results from such a query, it is not enough to run the search itself, one first needs to click another button to complete the list. Queries can also not be written directly into the search bar, they can only afterwards be modified in it – however, once again they can only be modified one by one. As for the result sets of the more sophisticated queries, I have not checked whether modifying queries results in incorrect data output, but it certainly is not impossible.

Saving result sets and returning to work with them when starting up the application again is possible. Unfortunately, the search results, exported into .rtf or .txt, are by default saved in the application folder on the computer. They then do not appear in the Windows explorer even when "show hidden files" is enabled. If exported to another folder on the computer and navigated to from the interface, Rundatabas appears not to recognise them anymore. Search results are consequently not transferable even between computers, unless one copies the whole application folder (and hopes the mysterious hidden file has been copied as well).

Other export functions of the programme include .csv-, .gpx- and .shp-files as well as Google Earth and Maps. They work, however in testing I noticed that occasionally, .csv-files will have to be exported twice before the file also includes the text from RUNDATA.RUN. The same appears to be the case for .shp-files. Additionally, and at least in the .csv-files, there is no UTF-8 encoding enabled, instead they appear to be using Windows-1252, which may result in problems when the data is used with other current applications (Section 3.3 discusses character encodings). LibreOffice, for example, one of the most used open-source office suites and as such popular amongst students, uses UTF-8 as its Character Encoding Standard (CES), resulting in unreadable characters (Figure 4). So while there are a number of export functions, in reality they are tricky to use. The only way to include the information from Rundatabas in my DB was to turn the underlying files into properly encoded .csv-files, which could be imported into another DBMS. Having done this, I can conclude that one of the main problems with Rundatabas is a structural one. The signum, which acts as a primary key (PK) within the DBMS, is not only composed of multiple values derived from other attributes (the first part indicating the find spot area, the second making use of a number from a current runological edition of inscriptions from that area, the third indicating a number of things, cf. section "Signum" in "Help"), but can, and will, be altered when some of that information changes. Accordingly, every single time a signum is changed, for example because the edition referred to is replaced, the signum has to be changed in the other files as well – a sure-fire way towards data corruption, as PKs *must* represent a *consistent, unique* point of reference especially in RDBMS (Section 4.6.4).

Beyond the information requested by Düwel (2008), RUNDATA.INF also contains data hinting at the origins of the project, which started out as a DB of the Viking Age inscriptions in Sweden, which tend to be on runestones. Therefore runecarver, an alternate location (in case the monument was moved from its original location) and stylistic details are included in the file.

Concluding this survey, the range of information provided by Rundatabas corresponds fairly well to the demands of runologists and while the lack of a consistent PK is a serious issue, data redundancy is avoided at least in those files pertaining to the inscription contents. Using it, however, is not intuitive, and requires users to have at least a generic understanding of a runologist's work and the data files. Documentation for Rundatabas is commendable, even if non-specialists may find it difficult to understand. The range of information provided is overall satisfactory, yet it lacks a digital, visual representation of the runes themselves (even if links to pictures of inscriptions are provided where possible) and proper literature references to a single inscription. Most importantly, different interpretations, or more precisely, conflicting scholarly opinions of what the runes read are missing. In some cases, Rundatabas makes use of the character combinations "§P" and "§Q" to indicate an alternative interpretation, but this fallback only occurs in a few cases. Equally, in some cases "/" between two possible solutions is used, but again, it is not a general occurrence (Peterson 1994: 307). Therefore it does not fully satisfy the outlined criteria (Section 2.2), as Düwel (2008: 62) specifically mentions that very few interpretations can by default be regarded as right or wrong and should therefore be considered whenever a new interpretation is undertaken. While he writes this about runic inscriptions dating to the early time of runic writing, it still holds true for later inscriptions.

2.2.2 *Projekt Evighetsrunor*

Between 2017 and 2020, scholars from the Uppsala runforum (where Rundatabas is maintained) and Riksantikvarieämbetet have worked on transferring the data from the original files into a proper relational model as part of Projektet Evighetsrunor. The most important outcome of this project is the online platform Runor (*Runor* n.d.), which combines the digitised parts of the Swedish corpus edition Sveriges runinskrifter and the data from Rundatabas to provide a research platform with up-to-date information on Swedish runic inscriptions (Bianchi 2017). The online platform displays the results from an underlying relational DB, which in turn uses the data from the older Rundatabas-application.

The new relational model addresses some of the issues that were present in the older version; for example, the signum is no longer used as a PK, instead UUIDs (Universally Unique Identifiers) identify the entries in the database, while on the website, URIs (Uniform Resource Identifiers, unique character sequence identifying e.g. people, concepts, web pages) are used. The CES was also changed to UTF-8, thus improving compatibility. In terms of the underlying structure, however, the system of keeping the different steps of deciphering an inscription were maintained as separate entity types; RUNDATA.RUN is now designated "readings", RUNDATA.NFS and RUNDATA.FVN are combined in "interpretations", while "translations" uses the data from RUNDATA.ENG (pers. comm. Marcus Smith). A bespoke entity type "inscriptions" was also introduced into the structure, however the definition of this entity type is still not entirely clear and the data needs to be normalised further (pers. comm. Marcus Smith). The structures pertaining to the runes and texts themselves have, therefore, not changed. What has changed significantly is the structure of RUNDATA.INF, which was broken up and restructured into a variety of different entity types, the survey of which is beyond the present scope, since they pertain to script-external considerations like location, potential rune-carver, etc. While important, modelling these script-external aspects of runic inscriptions needs to be done with a view to what the underlying data looks like and where it came from; translating the script-external aspects of the Bergen runic inscriptions into this structure is inadvisable, because as Chapter 7 will show, the same script-external data for the Bergen inscriptions needs to be modelled according to the excavation methodology.

The new relational solution of Rundatabas/Runor is "meant to be an encyclopaedic database, in the sense that it doesn't include anything that is original and only found in that database, but rather provides a way to view and search all the most up to date agreed-upon interpretations from across the runological literature in one place" (pers. comm. Marcus Smith). Again a conscious decision was made against storing different interpretations, although in cases where there is no widely agreed-upon interpretation, XML-encoded text snippets were included, making it possible to display conflicting interpretations. These are not, however, treated as separate entities, as is the case with KDB and the model presented here. Conflicting interpretations which have found no widespread approval are too disregarded; the approach remains much the same as in the original Rundatabas. Since many runologists are likely still working with the old application, as recommended by the project itself (Bianchi 2020), and since the underlying structure and data model was not changed with regard to the runological aspects, here the old Rundatabas-files continue to be referenced.

Since there is both a need and a desire for a representation of a wider range of possible interpretations, which was picked up early on, KDB was in part developed as a follow-on model of Rundatabas.

2.2.3 *Kieler Runendatenbank (KDB)*

While Rundatabas' main aim was to collect all Scandinavian runic inscriptions and store them, the DB project running from 1993 to 1999 and again from 2001 to 2012 at the University of Kiel had a more specific research aim and a narrower selection of inscriptions. On its website, it is described as a linguistic DB of the oldest inscriptions in the Older Futhark (Runenprojekt Kiel 2016f). Like Rundatabas, it offers a variety of information on each inscription, including different interpretations, archaeological data and literature (Table 3). Additionally, it contains information on syntactic structures in inscriptions, the words therein and various grammatical aspects of the inscription language. Unlike Rundatabas, it marks potential forgeries. The data itself is stored in a MS Access-RDBMS and made accessible via a web-based interface in both German and English, so only a regular browser (Firefox, Edge, Opera, Chrome) and a stable internet connection are required to use it. The English interface has limited functionality, however.

Structurally, KDB is a relational DB, with GUI and RDBMS provided by MS Access and the website utilising JavaScript to display result sets. The DB itself contains four related tables, called respectively *Find, Interpretations, Words* and *Bibliography*.[4] This small number is surprising, as one would expect a relational DB storing so many different kinds of information to contain more tables (like the relational model underlying Runor). The entity model provided (Figure 5) reveals a number of JOINs (Section 4.6.3) connecting the four main tables, which according to Runenprojekt Kiel (2016c), "[...] are only relevant for the proper functioning of the database [...]" (my translation). The explanation for the low number of tables as opposed to the amount of data is to be found in the individual tables' structure instead.

Find "serves as the basis", with the field *Find-no* providing both the PK of this table and the reference point of the whole DB (Runenprojekt Kiel 2016g). Contrary to expectation, it does not only contain information on the find/object itself, but also information on the inscription, the geographical location of the object and the various types the object can be classified as, reminiscent of RUNDATA.INF.[5]

The next table, *Interpretations,* stores transliterations (Reading), normalisations (Interpretation) and Translation in separate columns, very similar to the spreadsheet structure presented in Table 2. Rundatabas stores each of those in their own file, which is compliant with data normalisation rules meant to reduce data redundancy. Further data integrity and redundancy issues appear in the form of *Interpretations* also containing information concerning the dating of the inscription and its language (Runenprojekt Kiel 2016h).

Comparing the approach to data modelling of KDB to that of Rundatabas, there can be no doubt that the latter's structure is much more in keeping with the principles underpinning the relational model. Granted, *Interpretations* in KDB provides previous interpretations from scholars who have already worked with the inscriptions and concise information on these, which Rundatabas does not,

[4] In German referred to as "files" (Datei) instead of "table" (Tabelle) or "entity type" (Entitätstyp), either of which would be more correct and in keeping with the technical terms. This is particularly misleading because any DB built in MS Access only consists of one "file" that the user can see. It is true that within said file, all data is stored, but the use of "file" in this definition is still highly confusing. Equally, "indexes" appears to be used to describe PK-columns, whereas actually, every PK-column is an index, but not every index column stores PKs.

[5] All tables with their fields are presented at http://www.runenprojekt.uni-kiel.de/beschreibung/7/default_eng.htm.

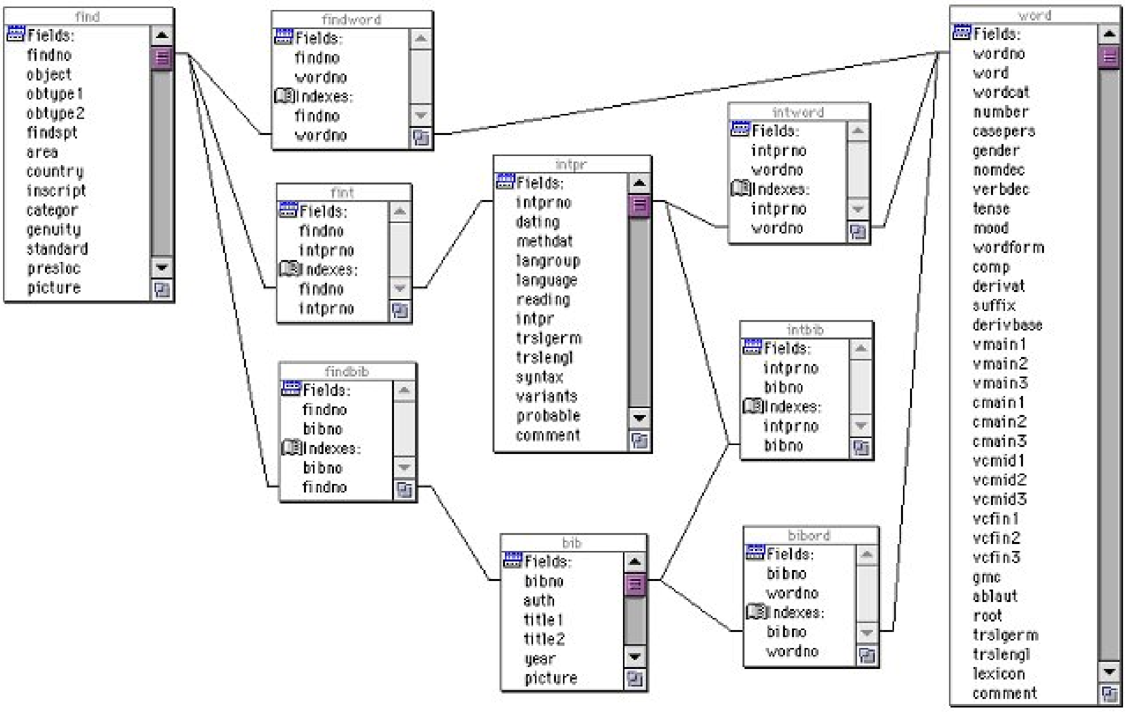


Figure 5. *Screenshot of the Database Tools window in MS Access, showing the relationships between the different tables of KDB. Reprinted from Runenprojekt Kiel (2016c).*

thus escaping some of the issues inherent in storing conflicting interpretations. The structural issues in KDB are nevertheless so severe that Rundatabas is the more functional model. These issues open up for various possibilities of corrupting data and hindering proper processing, for example when there is only one entity type storing interpretations, necessitating a table structure similar to Table 2.

The most extensive table by far is *Words* with 34 columns. Whether this table would have been better broken up into smaller ones is difficult to establish for someone without the same kind of linguistic background; even lacking the training, other projects like the Skaldic Project however suggest that different structuring could have improved the KDB model (Wills 2013). Similar analyses have also been undertaken by scholars working with manuscripts, resulting in the Medieval Nordic Text Archive (MENOTA) Standard for encoding, which permits the marking up of single words and characters by way of using XML (*Menota Handbook 3.0. Guidelines for the electronic encoding of Medieval Nordic primary sources* based on *TEI: P5 Guidelines* 2020). Since this solution is not based on the relational approach and the approach to data structuring is vastly different, it will not be discussed here.

Bibliography provides literature references for each inscription and unlike Rundatabas, in this case only the references concerning the inscription in question are presented. According to the German version of the website, only literature published since 1960 was entered into the table (Runenprojekt Kiel 2016d), although Runenprojekt Kiel (2016a) states that literature from the early 19th century until 2009 is included.

Theoretically, the relationships between the tables (Figure 5) should provide a lot of flexibility in terms of potential queries. But while KDB provides the required different interpretations of runic inscriptions that Rundatabas lacks, it is much more limited in search functionality. As a matter of fact, users can only define search criteria regarding specific aspects of an inscription, otherwise they are limited to using preconfigured queries (Figures 6 and 7), for example “Types of inscriptions”

Figure 6. *Range of possible, predefined queries on the German version of KDB. Screenshot from Runenprojekt Kiel (2016b).*

or "Inscriptions on a type of object" (the latter only available in the German version). While these were most likely chosen with regard to what users might generally want to know, with the exception of those relating to words and syntax, the queries still do not go beyond what Rundatabas can do, if handled properly. With queries in Rundatabas being stackable (even if that is a complicated process), the search functionality of Rundatabas is, in fact, better than that of KDB.

There is also no dedicated export functionality; it is only possible to copy-paste from the website, a process impeded by the fact that in the displayed result sets, the PKs connecting the entries (Find-no) is not shown, instead the whole list is renumbered for every search. Users looking to compile a larger data collection for several inscriptions are therefore bound for a lot of copy-pasting and manually connecting entries, whereas Rundatabas permits users to connect entries via the (admittedly problematic) PKs.

These restrictions in querying KDB are most likely due to the aforementioned problematic data structure. It is striking how many different types of data one table in KDB contains, as opposed to Rundatabas, where only one file can be reasonably said to store different types of data (RUNDATA.INF), an issue that was resolved in Runor. This could be blamed on inscriptions in the Older Futhark being more difficult to interpret and therefore, resulting in more contradicting interpretations, but as Chapter 5 will show, this is by no means uncommon for younger inscriptions either. The single table is all the more surprising since KDB relies on a proper RDBMS, and splitting data into smaller sets by applying data normalisation rules and defining proper entity types, which would have resulted in a more flexible structure and increased functionality, would not have been an issue. It must also be mentioned that, even if KDB provides more information on the single inscription, its use is similarly difficult as the use of Rundatabas, although for different reasons. The web interface may be easier to access and OS-independent, but queries can neither be stacked nor saved, ultimately limiting users to the research questions the DB-designers had in mind. These are mainly questions of a grammatical and syntactic nature, as implied by the heavy importance placed on the *Word*-table. But again, not all queries concerning the syntactic structures are available in both German and English.

In conclusion, while KDB has implemented the concept of conflicting interpretations of one inscription and further developed the idea of Rundatabas by including the possibility of searching for specific linguistic structures, it still suffers from the problem that the relational model was

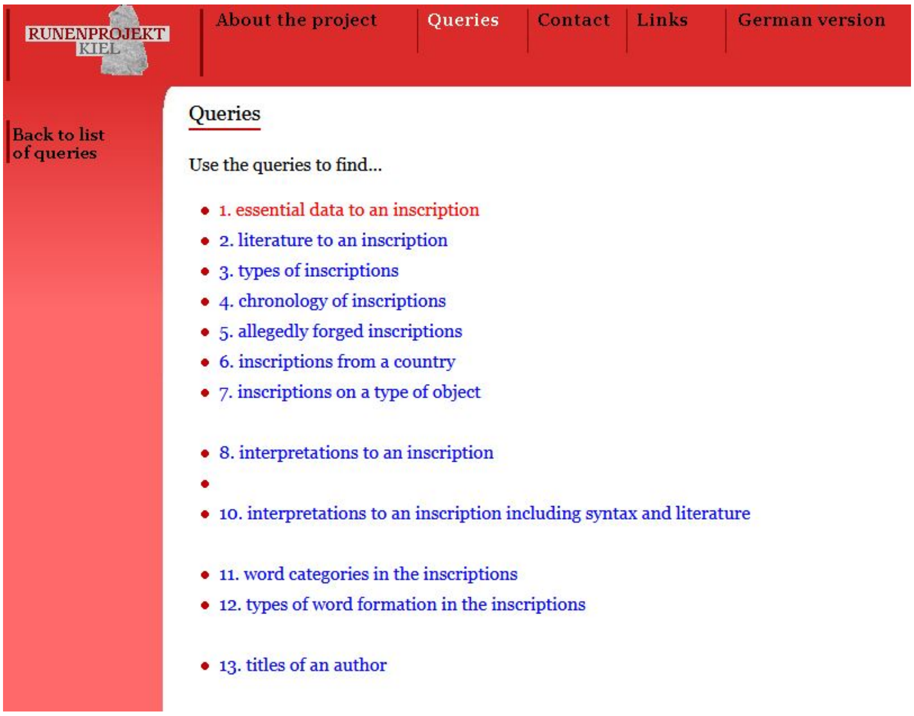


Figure 7. *Range of possible, predefined queries on the English version of KDB. Screenshot from Runenprojekt Kiel (2016e).*

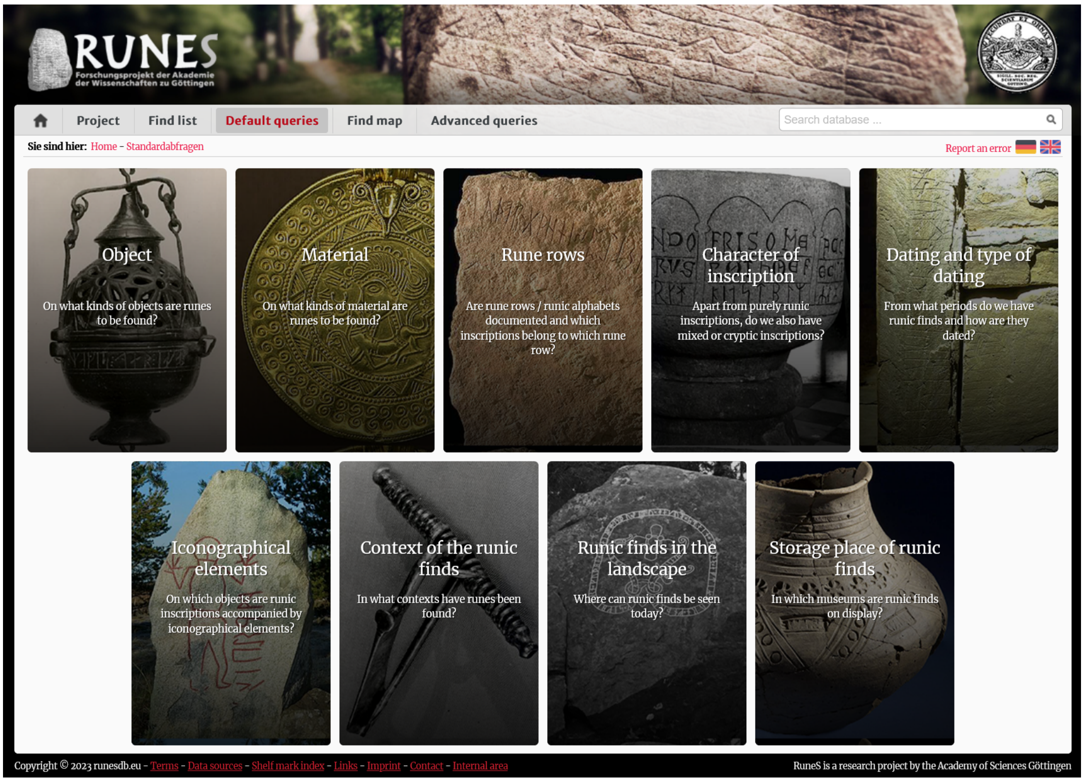


Figure 8. *RunesDB web GUI default queries, screenshot of https://www.runesdb.de/standard-queries.*

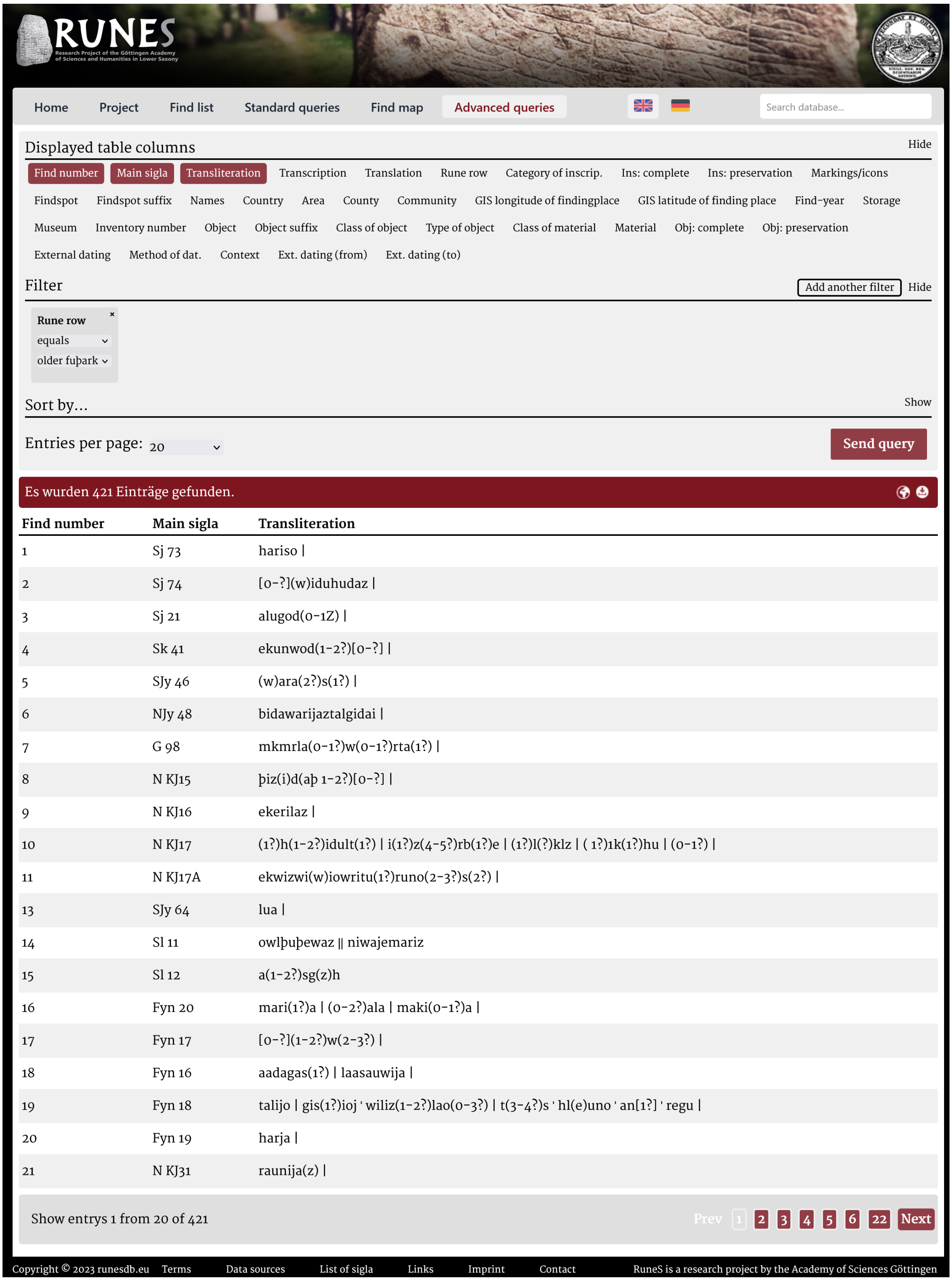


Figure 9. *RunesDB web GUI advanced queries, screenshot of https://www.runesdb.eu/advanced-queries/.*

only in part properly implemented. The lack of data normalisation poses serious issues for data integrity and retrieval, and in combination with the web interface severely limits the functionality and usefulness of the DB/DBMS.

2.2.4 *Projekt RuneS/RunesDB*

Having been under construction since about 2010, *Projekt RuneS*, financed by the Akademie der Wissenschaften zu Göttingen, has built another runic DB based on KDB, called RunesDB (*Projekt RuneS* 2018). This project is in many ways a continuation of the *Kieler Runenprojekt,* and the data is likewise accessible via a web interface, with MySQL providing the RDBMS and TYPO3 the interface (pers. comm. Thomas Bode). While it should have been included in this overview, as of March 2023, the website does not provide information on the actual data structure within the DB and inquiries from my side did not receive a reply. Considering which data is available on the inscriptions and how it is entered, suggests however that the underlying data structure applies the same entity model as KDB. The predefined queries likewise suggest that structurally, there are probably no great differences between the two data models (Figure 8), although Advanced queries are now available (Figure 9). If the “Displayed table columns” mentioned to the upper right in Figure 9 correspond to the actual columns in one entity type, that supports the conclusion that structurally KDB and RunesDB are the same or at least, very similar (compare Figure 5). However, the displayed table columns could just as well be the result of a VIEW created by querying a set of underlying tables, and it is not possible to tell by looking at the GUI. RunesDB is therefore excluded from further analysis until more information becomes available.

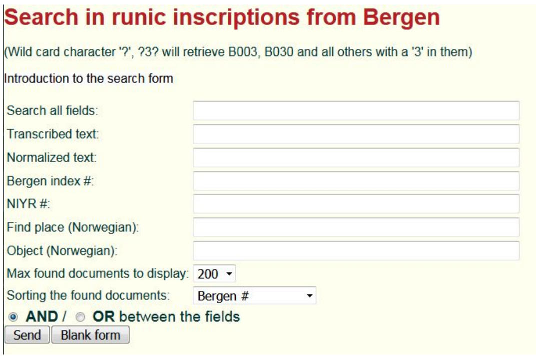


Figure 10. *RFB web GUI.*

2.2.5 *Runer fra Bryggen (RFB)*

Instigated in January 1993, the project *Computerising the runic inscriptions at the Historical Museum in Bergen* was not aimed at a generic presentation of the Bryggen inscriptions to begin with, although it ended up being “the first generally available overview of all the material from the Bryggen excavations up until 1996 with a transcription and normalization” (*Runic inscriptions from Bryggen in Bergen* 2002). Technically, that makes it the most important DB within the scope of this publication, as it also uses the Bryggen inscriptions as an example corpus. Originally RFB was aimed at developing a transliteration system based solely on the graphic form of the runes instead of transliteration traditions (*RuneType 2002* 2002); funded for three years, it appears to have run for longer than that; the website was still maintained in 2003, while the publication on their methodology appeared in 1998 (Ore, Tweedie & Dougan 1998). In the meantime between the original thesis being written and this work being published, all material pertaining to RFB has been removed from the web, with the future of the data remaining uncertain. That unfortunately also includes the DB originating from this project, which appears to have been more of a side-product of the typology project, as the lack of a complete list of all Bryggen inscriptions necessitated cataloguing them before starting on the analysis of the runes (Haavaldsen & Ore 1995-2003). To begin with, HyperCard was chosen to help build the collection in 1993, but the data was transferred into Claris Filemaker Pro in 1994. Several revisions of the data before actual analyses began are also mentioned (Ore 2002; Haavaldsen & Ore 1995-2003).

The aforementioned data mainly originates from the paper card archive the Norwegian runologist Aslak Liestøl compiled when he was first working with the Bryggen inscriptions, although the original cards in the Runic Archives in Oslo seem to have been consulted only in cases where the copy kept at the Historical Museum in Bergen was insufficient (Haavaldsen & Ore 1995-2003). In addition, information from for example *NIYR VI* (= Liestøl & Johnsen 1980-1990) and other publications available at that point in time was added, which also includes information from unpublished masters and doctoral theses, with a complete bibliography originally available in Haavaldsen & Ore (1995-2003).

As a number of the Bryggen inscriptions were considered unpublishable by the project members, one reason for designing a DB was "[t]he wish to make a catalogue of the 'unpublishable inscriptions from Bergen'" (Haavaldsen & Ore 1995-2003). I can attest that the information on Liestøl's cards tends to vary quite a bit; at times he offers transrunifications, on most occasions he provides a transliteration, sometimes a normalisation, rarely a translation. Comments can also be found on those cards, pertaining mostly to the inscription, but also the object and other observations. Since the variation is so great, it is impossible to clearly outline what kind of information is available. It appears however that only transliterations and normalisations have made it into RFB (Table 3 and fig. 11), along with some archaeological information and, in some cases, black-and-white photographs (mostly of insufficient quality to recognise the runes). The available information is in no way properly normalised, however, lacking for several inscriptions, outdated (especially datings of any kind), and only meaningful if the user already has solid knowledge of the Bryggen excavations and the excavation techniques used. The + for information on particular aspects of the inscriptions in Table 3 has therefore to be taken with a grain of salt. Some of it is more or less encoded in the wording ("under bolverk" for example implies a secondary deposition, Section 7.2.2) or actually included in the preface of the catalogue, and will not appear in the search result.

Finally, while most of the documentation (not as extensive as in the case of Rundatabas, but still carefully presented) is available in Norwegian as well as in English, the actual data on the inscriptions is not. Knowing Norwegian is therefore a prerequisite to making sense of results.

There is no entity model or any other information provided about the structure of the DB, but judging by the GUI (running PHP server-side, Figure 10), it may be supposed that it is little more than a spreadsheet containing the basic information outlined above. While find place and object are presented as searchable fields, they do not appear to work, and perhaps their existence is explained by early plans to include Swedish and Danish runic inscriptions in the DB (*RuneType 2002* 2002). Search results can be sorted by different fields, and the interface allows combining different search criteria by using AND and OR operators. Yet the search functionality does not work well, not at all when using "Search all fields", "Transcribed text" and "Normalized text". "Bergen index #" as well as "NIYR #" work as required, however "B" needs to precede the actual number in the former field for the DBMS to be able to retrieve something. The BRM-number, which is the archaeological reference, is not shown in the search results and also incomplete. Using the wildcard character "?" works as well, but again only in the aforementioned working search fields. In many cases, especially when looking for inscriptions one already has a vague knowledge of, it is actually easier to use the catalogue, which lists the BRM-number (in Haavaldsen & Ore 1995-2003). All things considered, the GUI is only useful for those who already know either reference number. As in the case of KDB, there is no download functionality available, but again, copy-pasting from the website itself is an option.

In the case of RFB, the DB structure is probably less interesting than what was apparently attempted with the data. Although not available online, physical measurements of 221 individual runes were taken from ca. 50 inscriptions and these processed with the help of the DB, resulting in a cluster analysis of runic signs from Bryggen (Ore, Tweedie & Dougan 1998). To my knowledge, this is the first attempt at mechanically processing rune forms with the intent to provide "a typology of runic forms based on graphic criteria" (*RuneType 2002* 2002). If the project had continued after 1998, when the first report on the findings was published (Ore, Tweedie & Dougan 1998), it would potentially have been possible to reach the other two goals of the project as well, namely to "develop and evaluate computer based methods for reading difficult and damaged runic inscriptions" and "develop and test computer based methods for studying form variations of runes" (*RuneType*

Resultater fra søk i runeinnskrifter fra Bergen

Bergensnummer:	**B004**
NIYR-nummer:	
Bergenmuseumsnr.:	**BRM000/03028**
Andre nummer:	**brnr1547**
Datering:	**Etter 1332.**
Gjenstand:	**Hodeskalle av hvalross med utskjæringer.**
Funnsted:	**Bryggen.**
Transkribert tekst:	**io(an)a**
Normalisert tekst:	**Jóhann á**
Publisert:	**Liestøl, (64)** **Spurkland (91)**
(Foto) Aslak Liestøl	b004-detalj.jpg
(Foto) Aslak Liestøl	b004.jpg

Søkeresultater fra: 24.10.18 - 23:42

Figure 11. *Information available on a randomly chosen runic inscription.*

2002 2002). Unfortunately, despite the authors' proposals for future projects, nobody appears to have taken up their approach. Equally unfortunate is the fact that there is only a screenshot of the Filemaker Pro GUI provided as a reference for how the section of the DB containing these measurements was actually set up (*RuneType 2002* 2002), giving little clue what the underlying structure looks like.

As merely a means of support for the proper project, RFB was supposed to be superfluous within a few years to begin with (Haavaldsen & Ore 1995-2003), and the data on which the graphemic analysis was based, meant to be publicly available (Ore, Tweedie & Dougan 1998). Neither appears to have happened and no further projects appear to have taken up the line of investigation pursued by the original project. In terms of usefulness, RFB is probably the least useful of all DBs presented so far; in terms of making use of mechanical data processing in order to help decipher runic inscriptions, the project has however brought forth interesting ideas and managed to show how these can work. The project can be understood as a precursor to the discussion about the difficulty of representing runes digitally in Chapter 3.

2.3 Digitising runic data – inherent problems

Taken together, the existing runic DBs provide a fairly comprehensive overview of existing technical solutions and modelling choices, how useful these are in terms of benefiting research, but also an overview of the topics runologists are interested in. Most often runic inscriptions are, by virtue of being text, subject to linguistic, textual and, in a broad sense, historical analyses. Rundatabas was meant to provide an overview and a starting point; KDB is very clearly aimed at linguistic and textual analyses; RFB was intended as a starting point for typological analyses of runic characters. Their design is tied in equal measure to the technological resources available/chosen and the overall research questions they were built to help answer. This by itself is not necessarily a drawback, as the advantages of RDBMS lie mainly in their customisability. But since each DB was built around a particular research question, each also lacks something included in another. The main reason for the situation being what it is, is well explained by Findell (2014: 80), who remarks that runology

> [...] is an eclectic field, drawing on a range of disciplines including linguistics, archaeology, art history, literary and cultural history. Specialists in each of these areas bring to bear their own particular interests, methods and theoretical backgrounds in the effort to understand both the inscriptions and the cultural contexts in which they were created.

This diversity of scholarly backgrounds and methodological approaches is reflected in every publication of runic inscriptions, and requires extensive knowledge about various fields of scholarship on the part of the runologist, as well as a great amount of flexibility in any tool they are going to employ. RDBMSs are singularly well-suited to map and explore ontological relations between different types of information concerning runic inscriptions, but as the survey also shows, the approach to data modelling differs vastly between the DBs.

The argument could be made that the different research questions these DBs were built around render comparison moot, as each of the tools is meant to serve different needs. I disagree and instead contend that each DB is at least in part built according to runological methodology. Deciphering an inscription is not a single, smooth act; from the first identification of the runes to a final evaluation of the inscription's purpose, the process of deciphering a runic inscription requires several steps and draws heavily on other disciplines. However, the most basic of these steps, to which layers of interpretation are slowly added as the runologist considers more and more aspects of the inscription's content and meaning, remain the same:

1. identify the runes;
2. transliterate the runes into Roman letters;
3. normalise speech items represented in runes to the standardised version of the appropriate language.

Each of the presented DBs mirrors these steps (minus the first, the intricacies of which are discussed in detail in Chapter 3), yet they model the resulting data in different ways. This, in turn, exposes how preconceived notions about data and its nature have impacted data modelling and therefore, the range of research questions scholars can reasonably expect each DB to help them with. To understand the issue, it is essential to examine what kinds of data are discussed here, an issue already referred to above (page 19).

The main issue and point of criticism of Rundatabas, which could also be aimed at RFB, is the lack of alternative interpretations, an issue which KDB sought to rectify. But runologists do not only disagree on rune identification, transliterations and normalisations. Archaeologists, from their side of the debate, also have something to say on various matters concerning runic inscriptions. In fact, archaeological considerations concerning the rune-inscribed object (since most runic texts are carved into a hard surface rather than written down on parchment/paper) are often equally important as linguistic or rune-typological considerations, not least because controversies about an inscription may already start at the question of dating. Such controversies are typical and one of the main driving forces of humanities research, which in turn renders it absolutely mandatory that the tool chosen to curate a large collection of runic inscriptions be capable of representing these controversies. In the early days of Digital Humanities, including controversial opinions might have presented an issue on account of limited storage space. Today, the storage capacities available are in excess of what would be required to store all interpretations of all known runic inscriptions in the world. But storage is not the issue here; rather, the question is one that marks the start of many digitisation projects: the not-at-all neutral and very important question of what information and which interpretations to include. Tanner et al. (2016), although the examples are taken from different areas and focus more on clashes of interest between different stakeholders, makes the very useful point that the choice of what to digitise is, in itself, already a statement. A value judgement is being made of what is "worthy" of being stored and what is not.

While data in a runic DB may not be considered "facts", it is very much a fact that almost any piece of information concerning a runic inscription can change; dating, reading, interpretation, even the physical dimensions of the object may change owing to conservation issues.

In other words, runic data is very mutable. Yet data modelling in the existing DBs implies, at least for some aspects, that the data is not subject to change and further research; that it is, in fact, a set and certain value. This finality is expressed in the data structures, resulting in the major issue that Nygren et al. (2016: 63) mention in regard to maps, graphs and tables, namely the apparent finality of the digital representation. In Rundatabas and RFB, it is the lack of alternative transliterations and normalisations, in Rundatabas also RUNDATA.INF, which does not follow the principles of data normalisation either (which issue has been taken care of in the newer relational model). In KDB, similar issues appear not only in regard to transliterations, but when, for example, different object classifications are stored in three columns in *Find* instead of being split apart and stored elsewhere. Three columns may appear quite generous, but clearly show the inadequacy of storing data this way. Anyone acquainted with the number of archaeological classification systems knows that one and the same object can be classified by several different typologies (which may also impact on the relative dating of objects). When the number of classifications allowed is limited by the design of the DB, however, some data must be disregarded and these decisions must be justified in much the same way a theoretical approach must be justified. Yet the greater issue is created by these conflicting pieces of data not being included, not even being allotted space in the data modelling process. The resulting DB can be mistaken to represent the "truth" – in itself a problematic concept, but even more so in this context.

Tanner et al. (2016) discuss these issues in relation to digitisation of museum collections, but their observations can be applied to information available about runic inscriptions. Runologists today are faced with ca. 6500 runic inscriptions, many of which were interpreted more than once, some dozens of times, with a sizeable amount of literature supporting or decrying certain interpretations, not to mention the other aspects just discussed, which are equally subject to further research and by no means "facts". The data models underlying the currently available runic DBs do not allow for all of these aspects to be represented to the extent they exist in research. This contradicts research principles, which demand that every new interpretation, or attempt at it, has to take older interpretations into consideration. Besides being academic tradition, it is also a practical necessity; as Paysan & Düwel (2020) were recently able to show, runic inscriptions can be altered by the process of conservation and ageing further afterwards. Therefore runologists frequently return to older photographs, drawings and interpretations, especially when looking at inscriptions that have long been known, to check their own interpretation against those. That it is rarely easy to tell which is the best one, and therefore impossible to conclude and present a final solution, is a fact of life runologists have to live with.

Equally, an older dating based on a typology since gone out of use may not be correct anymore; when trying to find all literature pertaining to an inscription, it may nevertheless be of great importance to know that this inscription carrier was classified by this typology. Runology needs to consider research from so many different disciplines that using only one particular conclusion from one of them distorts the research picture. All of the pieces of information on an inscription are still data, and being data, they should be stored and processed. As Tanner et al. (2016: 17) put it, "Research benefits accrue when we invest in deepening our understanding of the world and build upon the intellectual legacy of previous generations. Digitised resources continue to transform the research process. The researcher can now ask questions that were previously not feasible. They can engage in new processes of discovery and focus their intellect more on analysis than data collation."

These inherent ambiguities in the data clash to a certain extent, not so much with the underlying principles of RDBMS, but perhaps more the desire of runologists to have at least a few certainties at their disposal. Moreover, owing to the complicated real-life circumstances, adequately storing all of these ambiguities requires an uncommonly high level of consistency and structure in the storage tool to retrieve meaningful results. The currently existing models cannot answer that demand, at least not to the full extent they could. Instead, they concentrated on modelling ambiguities for those aspects mattering in the research project they were built for. That does not make them bad DBs, but it does restrict the extent to which the data collected can be re-used to answer different research questions. The demand to include more and diverse data in one's analyses has created an increasing need for easy-to-use, powerful tools for managing and administration of data also in the humanities. If every runologist has to first create their own datasets from scratch or has to re-encode already existing data, valuable time is lost. Additionally, there is no guarantee that the resulting dataset can be re-used by someone else either. In a small field like runology, this also means a loss of resources – time and information. A desirable solution would therefore be to combine the best approaches in data modelling from the existing DBs and create a model that structures *all* available data in such a way as to make it possible to store *all* relevant pieces of information.

On the other hand, with runology traditionally reliant on various disciplines, it is difficult to determine what a DB model for the generic runologist – if such a person even exists – should look like (Lerche Nielsen 1997). At the current stage, it will most likely prove impossible to create a DB model answering to everyone's needs. Still, by analysing the data that appears in all existing DBs, it is possible to find a baseline with regard to the essential information every runologist needs about an inscription, and turn this into a basic model for a relational runic DB. Such a "baseline", or core DB model, also has to fulfil another expectation. It needs to be flexible enough to be built upon and expanded in two senses:

First, when new inscriptions are discovered, which is always a certainty.

Secondly, when new data on known inscriptions is uncovered – which again requires a different approach to data modelling than the ones applied so far.

Before proceeding to an outline of what an appropriate relational model could look like, there is one basic issue which needs to be addressed first. This issue, which so far has not been mentioned much, is the representation of the actual signs. Runes are notoriously difficult in that respect, and this problem is discussed in the next chapter.

Data	Rundatabas	KDB	RFB
Script-internal			
Transrunification	-	-	-
Transliteration	+	+	+
Normalisation	+	+	(+)
Translation	+	+	-
Alternatives of these	-	+	-
Visual documentation	linked if available	(+)	(+)
Rune types / classification	+	+	-
Linguistic / textual purpose	+	-	-
Communicative situation	-	(+)	-
Script-external / Context			
Object classification	+	+	+
Inscription-carrier relationship	-	+	-
Stress marks	-	+	-
Characteristic style	-	-	-
Provenance / original site (runestones)	+	+	-
Coordinates of original site	(+)	-	-
Find spot	+	+	+
Coordinates of find spot	+	-	-
Usage	+	+	-
Type of deposition	-	+	(+)
Circumstances of discovery	-	+	(+)
Period / Dating	+	+	+
Dating method	?	+	+
Material	+	+	(+)
General information			
Alternative signum / references / signatures	+	+	+
Literature references	(+)	+	+
Present location	+	+	+
DBMS			
	6 files, connected by signum Runor: MySQL	MS Access, 4 entity types RunesDB: MySQL	
User interface			
	bespoke, Windows Runor: web-based, JavaScript	web-based, JavaScript web-based, TYPO3	web-based, PHP
Languages	Swedish, English	German, English	Norwegian (English)
Help	+	-	-
Search functionality			
	highly configurable, use difficult	prescribed, mostly unconfigurable	(-)
Saving queries	+	-	-
Export functionality			
	rtf, txt; Google Earth &Maps coordinates, gpx, shp, csv	copy-paste	copy-paste
Additional information			
	rune-carvers; find spot/location; inscription purpose; cross form; style group	state of inscription & carrier; socio-historical interpretation; syntactic structures; grammatical structures; words; rune types/classification; forgery	

Table 3. Comparison of currently available runic databases. Follow-up models of Rundatabas and KDB are not included for the reasons explained, respectively, in Sections 2.2.2 and 2.2.4.

3 Runes on screen

Digitisation projects often have different goals and depending on those, the theoretical approach and tool/technology chosen can vary significantly. Where textual sources are concerned, the main aim is often to create a digital representation of the original. How this is achieved depends on what scholars want to get out of it, with the primary difference being whether the aim is to capture machine-*viewable* or machine-*readable* text (Deegan & Tanner 2004: 492-494). The former can generally be achieved by taking a high-quality digital image of the source text; such a digital facsimile edition is less costly and easier to distribute than paper prints and can also be used for purposes of "virtual reunification", where collections now spread across the world are brought back together virtually (Deegan & Tanner 2004: 491). The text on those images, while readable for the human looking at it, is not readable for the computer, however. It is therefore impossible to search for particular keywords or conduct analyses of how often specific phrases appear in one text (which can, for example, be used for authorship studies). If a digital representation of text has to be machine-readable and -searchable, a different approach is needed (Tanner et al. 2016: 32).

Runic inscriptions pose serious problems for digitisation already at this stage. While not explicitly mentioned in the last chapter, the most striking disadvantage of the DBs presented is the lack of actual runes, discounting (links to) pictures (representing the machine-displayable/viewable side of things). Yet RFB was devised with a view to comparing the shapes of different runes in order to find clusters and develop a typology base on those (*RuneType 2002* 2002). In fact, the shape, form and variations of runes have been the topic of several scholarly publications, the last being Palumbo (2020), and are an integral part of every examination of a runic inscription.

To properly understand the issue, it is necessary to delve into the intricacies of how runes developed as a script, how computers display script and the process of character encoding.

3.1 The historical development of runes as a script

Runes were actively used as a writing system for approximately 1700 years between the 1st and 19th century AD. They are an alphabetic or phonemic script, meaning each sign (often referred to as grapheme) in the repertoire supposedly represents one or more phonemes (for example Waldispühl 2013). Runes were used for a variety of languages and changed over the course of time, as did peoples' use of the system itself. In Scandinavia, the runic writing system underwent two major developments; first the Older Futhark, in use between approximately the 1st and 8th century AD and containing 24 signs, lost 8 runes over the course of the 8th century, becoming the Younger Futhark with only 16 signs. Around the same time the spoken language develops from Proto-Scandinavian (also called *Proto-Norse, Old Nordic/Scandinavian* or *Urnordisch, Altrunisch* in German) to Old Norse, with OWN (Norway, Iceland and Greenland after the settlement) and Old East Norse (Sweden, Denmark). Both dialects contain more speech sounds than Proto-Scandinavian, but the number of signs for expressing these in writing is decreased instead of increased (discussed, for example, in Spurkland 2005).

In the second development, likely coinciding with the end of the Viking Age, the Younger Futhark was expanded by new signs to better express the variety of phonemes, and diacritic signs help differentiate multivalued runes (signifying more than one sound value). In scholarship, this variant of the Futhark is often referred to as "medieval". The use of diacritic signs was however not imperative and neither was the use of the new signs, so especially medieval inscriptions can prove confusing and hard to date (Düwel 2008: 88-94; Spurkland 2005: 150-151). Additionally three more or less distinct runic writing systems developed, called *long-branch, short-twig* and *staveless* runes (Seim 1998: 43). Rune-carvers could use the character repertoire of one, two or all three of these systems within one inscription, although the latter is not common. Long-branch and short-twig runes seem to appear together fairly frequently (Seim

2013: 179-184), however, there is, to my knowledge, no study of the frequency of these occurrences. "Cryptic runes", where the rune in question is indicated by a code, also appear (Nordby 2018).

It is clear that the development of runic writing is somewhat more complicated than that of the Roman script. To avoid confusion, scholars generally refer to distinct systems as "rune rows" or "Futhark/fuþark". The latter is used to differentiate between "older" and "younger" Futhark, with the term equivalent to Greek "alphabet", referencing the first six letters of both Older and Younger f-u-þ-a-r-k, like "alphabet" references the first two letters α and β. It is itself a modern invention; historical evidence for what the Germanic peoples called their writing system is lacking (Seim 1998: 10). Rune row, on the other hand, is used for referencing individual character sets, like the long-branch rune row, or even a row of runes on a particular object. Although they are, as far as current scholarship was able to establish, separate systems, the signs are still similar enough to count as variations of the Older Futhark and several runes are used in more than one of the subsystems (Seim 1998: 44). As a matter of fact, the runes of different rows may in many cases simply be considered variations upon an underlying "idea" (Section 3.3.4; Barnes 2012; Seim 1998 discuss the distinguishing criteria of the three rune rows, particularly long-branch and short-twig).

For runologists, this presents a serious obstacle: one and the same sign may signify different sounds in another system, and it is not always clear which (sub)system prevails in an inscription, especially during the transitional periods from Older to Younger and medieval Futhark (for example Seim 1998: a survey of Futhark-inscriptions from Norway dating to the Viking Age and Middle Ages; see Barnes 2012: 19 for a more general discussion). Yet to properly interpret runic inscriptions, identifying the writing system is crucial. In the case of an independent dating of the inscription carrier, this will provide a clue to rune row and language used. Then again, "[t]he criterion most often used for dating a runic inscription is the language in the inscription" (Spurkland 2005: 131); i.e. the runologist has already made a decision which runic row and language(s) the inscription is written in and interpreted it accordingly. This approach can easily turn into a circular conclusion.

Since several runes are used in more than one rune row, the combination of signs often determines which row was used. In some cases, reaching a conclusion is impossible, as inscriptions can be so short that only signs belonging to either system appear. In such instances, runologists tend to look more closely at the shape of each rune in hopes of finding distinguishing characteristics. This results in another problem. As a script, runes probably developed through contact with the Roman script; yet unlike Roman letters, runes appear to have been designed to be carved into hard materials, wood, stone, bone or metal. The largest number of runic inscriptions can be found on runestones in Sweden. They occasionally appear in manuscripts, where they fill gaps in the Roman alphabet (like the letter þ, pronounced /θ/), or are used as abbreviations; in some cases they are also presented in connection with scholarly essays on runes, and the manuscript *Codex Runicus* is written completely in runes (Düwel 2008: 189-196). Yet runes were never accepted as a standard script for manuscript writing and, later, the printing press. Additionally, with runes being an epigraphic script (i.e. being carved into some hard material rather than written on paper with ink), the object's material, the skill of the rune-carver and conditions such as lighting, movement while carving and other external circumstances have likely influenced the shape being carved (Düwel 2008: 16; Seim 2013: 159). The signs may well have been damaged over the course of time, too, thereby creating doubt about their status as runes or shapes where in the beginning there was none. Consequently, it is much more difficult for runologists to agree on what we take for granted where Roman letters are concerned – a standardisation of rune-shapes, and the ability to determine meaningful deviations from this standard.

3.2 Representation of runes in print

For a digitisation project, such as the creation of a DB, careful consideration is therefore in order. Is representation of runic inscriptions in the form of machine-viewable text desirable, or would it be more convenient to (also) have machine-readable text available? A solid argument can be made in favour of choosing machine-viewable text only, which prevents having to deal with the difficulties inherent in trying to standardise runes. This approach has a significant downside however, namely the wide variety of surfaces runic inscriptions are carved into. Over the course of this project, I experimented with using Reflectance Transformation Imaging and photogrammetry as well as 3D-photography on the Bergen inscriptions. The results, while in some cases promising, still show that digitising runic inscriptions, even only those carved into wooden sticks, requires the parallel use of several different approaches, which is costly, time-consuming, and the end result needs a lot of storage space. While still extremely desirable, this sort of digitisation is a team effort and should, in a best-case scenario, be conducted by trained specialists. The resulting wealth of digital images then also needs to be curated to be of use for more than one person, which in turn requires careful consideration of how this should be done. In short, it was simply not a feasible undertaking for a PhD project.

The other (and in an ideal world, complementary) solution is to render the runes machine-readable, so the DB can offer at least an approximation of what the runes look like on the original. This requires standardisation of the actual signs, with the additional benefit that runologists are already used to this process, since any printed representation of runes is necessarily standardised. The process is often referred to as “transcription”, although it is on occasion confused with “transliteration” (replacing the rune with a Roman letter signifying the same speech sound). In her doctoral thesis, where she tries to establish a typology of rune shapes based on medieval Futhark-inscriptions, Seim (1998) refers to the process as “normalisering” (normalisation), while the result is referred to as “trykkrune” (print rune) or “idealrune”. As mentioned previously, here the process of standardising runes for print or digital storage is called “transrunification”.

Whatever its name, this process is made more difficult by the fact that while there is general agreement that some aspects of the rune-shape probably have no bearing on its supposed sound value and cannot be counted as variations proper, runologists

Figure 12. *Transrunification and transliteration example 1 (Seim 1998: 363).*

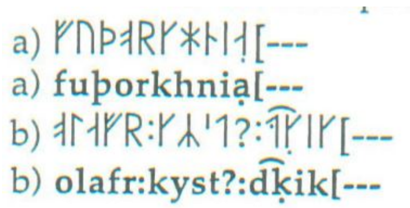


Figure 13. *Transrunification and transliteration example 2 (Seim 1998: 363).*

cannot always agree on which of these can safely be ignored. Most publications, as a first step in the examination of a runic inscription, therefore choose to offer a description of each single sign to outweigh the disadvantages of standardisation. Yet while there are certain commonly used terms for describing the formal appearance of a rune, these are by no means properly codified and vary between scholars and languages (see Waldispühl 2013: 75; for various attempts at formalising the description see for example Antonsen 1975: 6-9; Nowak 2003; Seim 1998; Spurkland 1991; Barnes 2012: 18-20; comprised in a matrix in Düwel 2008: 5-6). Further disagreements concern the acceptable level of standardisation, although Seim (1998: 49-50) points out that the degree of standardisation of the actual rune depends on the aim of the study in question. From this perspective, there cannot be a “right” amount of standardisation that suits everybody. Seim (1982, 1998) consequently establishes two levels of standardisation answering to different scholarly demands; these and their purpose are discussed later (Section 3.4.1). Perhaps in order to avoid this debate, the runic corpus editions from some countries have eschewed transrunifications, instead falling back on transliterations. Norwegian corpus editions however always present transrunifications (Seim 1998: 32).

Yet there is a further complication. Along with the development of certain conventions for standardising runes, transrunifications encode further information, with the conventions in part based on those of text-critical manuscript editions of texts (Seim 2013: 154, with reference to Haugen 2013: 118). Figures 12 and 13 offer two examples of transrunifications with additional signs.[1] These have a different significance as indicators for scholarly observations. Thompson (1981: 91) presented an overview of the conventions established by different corpus editions at the time; while he does not reference transrunification conventions, they converge to some extent with the transliteration conventions (Figure 14). His findings and developments since then in short:

In transrunifications – where they are customary – square brackets often signify a lacuna within or a broken-off inscription, with hyphen-minus (Figure 13) or question mark (Figure 12) standing in for a suspected rune which can be guessed at or is so damaged it cannot be identified with certainty. Ellipsis (with or without square brackets) can be used for the same purpose, especially when the number of missing signs is unknown. Brackets around a rune (Figure 12) are more ambiguous; the publication itself needs to be consulted in order to find out what they signify. In Rundatabas, for example, they are set around characters which interpretation is doubtful; then again, Rundatabas only offers transliterations, not transrunifications. The most common way to signify uncertainty in transrunifications is a dot below the rune (Seim 1998: 25-26), as is the case in Figures 12 and 13. Unfortunately this presents its own problems. Seim (1998: 25-26) discusses the convention, concluding that it is difficult to establish, even with information provided by the author, whether the dot is meant to signify "special rune" (meaning that based on experience, the scholar would not expect that particular rune in this spot) or "debatable identification of rune" without consulting the description of the actual signs. Part of the confusion, she writes, stems from the fact that even in corpus editions like *NIYR VI* where the use of dot is explicitly explained by the author(s), there are inconsistencies in the actual use, an observation I can confirm (Liestøl & Johnsen 1980-1990: vi, 1; Seim 1998: 20). As a further complication I would add that in publications where not only the identification of the right rune, but also the specific variation of that rune is of importance, the dot can take on yet another meaning: whether the particular shape is identifiable without doubt. All things considered, dotting a rune is by no means as clear-cut as it first appears to be. That runes with dots underneath are also a challenge where typesetting and layout are concerned, does not appear to be more than an afterthought for Seim; in the current context, however, it becomes an issue (Section 3.3.1).

A challenge in terms of typesetting and layout is also presented by a particular feature of runic script commonly referred to as "bind-runes". These are ligatures between two or, on occasion, even three runes sharing the same stave, comparable to Roman letter ligatures like æ or œ. They are common in runic inscriptions, but to my best knowledge, no publication of runes nor any runic font developed so far contains a full range of standardised versions of bind-runes, although various fonts currently under development are trying to incorporate bind-runes to a greater extent (pers. comm. Marco Bianchi, Odd Einar Haugen). The common custom is instead to indicate the bind-rune by using a character tie. Aside from the technological issues this convention causes (Section 3.3), there is another problem: while Roman letter ligatures are meant to represent a specific sound somewhere between the two sounds the ligature is made up of (æ for example signifies an /æ/-sound found in German and the Scandinavian languages), bind-runes do not represent a sound in between the two runes. They instead appear to be a kind of time-space-and-work-saving measure by utilising the same stave to attach two different runes to. Bind-runes can therefore not be formed by a rune without a full stave, like ᛌ; neither is ᛁ ever found as a bind-rune. Common combinations are on the other hand ᛆ and ᚱ or ᚢ, where the branch of ᛆ can be attached to the stave of ᚱ or ᚢ without distorting the shape of either: ᛆ͡ᚱ, ᛆ͡ᚢ. This does, however, not mean that the runes should be read in said order. They can be read ᛆᚱ or ᚱᛆ, ᛆᚢ or ᚢᛆ, without any indication as

[1] Runic script knows neither brackets of any form nor dots below the character (diacritic dots in runic script will always appear tied in with the rune, whether sitting in the middle of the stave (ᛂ) or in the space created by a branch/pocket (ᚵ, ᛔ)) nor punctuation as used in Roman script.

	Transliterations	Normalizations	Translations	Line divisions	Damaged or uncertain letters	Unreadable or missing but countable letters	Unreadable or missing and uncountable letters	Reconstructions or conjectural restorations	Bind-runes (ligatures)
Wimmer	s p a c i n g	*italics*	"quotes"	‖	( )	[xxxx]	. . .	[ ]	e͡r
DR	**boldface**	*italics*	s p a c i n g	|	( )	xxxx	. . .	[ ]	e͡r
IR	s p a c i n g	*italics*		line by line	( )	- - - -	- - -	[ ]	e͡r
SR	**boldface**	*italics*	"quotes"	line by line	ḍọṭṣ	- - - -	. . .	[ ]	e͡r
NIyR	**boldface**	*italics*	"quotes"	line by line	( )	****	. . .	[ ]	e͡r
Krause	**boldface**	*italics*	"quotes"	line by line	ḍọṭṣ	xxxx *or* [xxxx]	///	[ ]	e͡r
Dickins	'quotes'			|	*italics*	. . . .	. . . .	[ ]	e/r
Page	'quotes'	*italics*	'quotes'	|	*italics*	* *or* [.]	–	[ ]	e/r
Antonsen	**boldface**	*italics*	'quotes'	line by line		****		[ ]	
Leiden				|	ḍọṭṣ	. . . . *or* [. . . .]	] *or* [*or* [ ]	[ ]	

Figure 14. *Conventions of marking up text in runic corpus editions as collected by Thompson (1981).*

to which order is intended in any given case. It is only by the process of deciphering the inscription that runologists decide on the order that makes most sense linguistically. Representing them as ᛏᚱ or ᚱᛏ is therefore, technically, prejudicing the interpretation, provided the aim of a transrunification is to standardise the runes without changing the original impression.

Yet another distinct feature of runic script are "Wenderunen". These are runes turned back-to-front or upside-down (or both) compared to the general direction of writing in an inscription (which can be written and read left-to-right and right-to-left, although the prevalent custom appears to be left-to-right, especially in later inscriptions). The difficulty of representation in print (or digitally) for these runes varies depending on what the mirror shape looks like. ᚠ turned upside-down or mirrored is more of an obstacle for printing purposes than mirrored ⊦, which looks exactly like ⊣. Some publications, like the new edition of the South Germanic inscriptions in the Older Futhark, solve the problem by using the available signs and indicating the writing direction as a whole or for the single sign with an arrow (Düwel, Nedoma & Oehrl 2020), but some runic fonts also offer reversed and rotated runes (for example Futhark A, Gullskoen).

The main problem with Wenderunen here however consists of how to represent them digitally, especially in cases where the Wenderune of one rune is identical to the common representation of another rune, as is the case with ᚭ and ᛆ. In many cases it is not clear whether the Wenderune appears as a kind of "spelling accident", was chosen with a specific purpose in mind or is even perceived to be a variation of the more commonly used rune (see for example Seim 1998: 107). Text digitisation projects like MENOTA often aim to provide as close a digital representation of the original text as possible, meaning that they offer a facsimile and diplomatic reading of the original text alongside a normalised version (*MENOTA* 2020; Evans 2016: 47). Yet runes are not only difficult to encode because of various opinions on the level of standardisation of the single sign, but also because the conventions established in print publishing encode more information about the single sign than simply what it looks like: they encode scholarly concerns and observations, and it would be very desirable to also be able to encode these in a digital representation. The most difficult and impactful decision in the digitisation process of runic inscriptions is therefore which digital representation to choose. Yet it is already disproportionately complicated to encode the runes by themselves, much less the scholarly mark-up, owing to how symbols are encoded in binary.

3.3 Fonts and character encoding

As discussed in Chapter 2, computers perform mathematical operations on information encoded in electronic impulses indicating either "on" or "off". Compared to humans, that puts them at a vast disadvantage in dealing with the real world. While we rely on visual, auditive and tactile information, computers have none of that. To find a piece of information, they need a unique reference enabling it to identify this information, best provided in strings of 0 and 1. This also applies to a single letter (Laue 2004: 147).

Humans, on the other hand, do not do well with information solely provided as numbers, and long strings of binary seldom achieve more than give them a headache. They do better with shapes they can recognise, so somewhere, something has to translate between computer and user. In the case of script, character encoding and font work together to provide each side of the interaction with the kind of information it can best process, with the character encoding providing the technological infrastructure and the font providing the visuals.

3.3.1 The principles of character encoding and encoding standards

Representing any letter in binary and processing it has from the start presented problems (for example Laue 2004). The first Character Encoding Standard (CES) was the ASCII standard; it was subsumed into modern CES, which kept the original ASCII encoding to maintain backwards compatibility. But in principle, every modern CES works in the same way as the original ASCII (Laue 2004: 147; Deegan & Tanner 2004: 494). In simplified terms: space on the computer – bytes – is dedicated to storing numerical combinations, which in turn encode a graphical representation of a sign. ASCII started out as a seven-bit encoding, was developed into an eight-bit encoding (both making use of 1 byte storage space). It has since been extended and enlarged in coding standards like ISO/IEC 8859 and Unicode, which in UTF-32 makes use of no less than 32 bits (equalling 4 bytes of storage space). While there is a variety of CES to choose from, amongst them Windows-1252 and ISO-8859-1 (also referred to as Latin-1), the one referenced and used here is UTF-8, mainly because it is the most used CES worldwide (web usage rather than personal computers), and also because it is almost fully compatible with either of the other CES.

One GUI allowing users to access the Unicode character map is *Babelmap*. Figure 15 provides an example; as can be seen, the code point references are created by combining the vertical digit/hexadecimal with the horizontal digit/hexadecimal (to be clear, the computer still does not perceive the alphanumerical code of the code point as letters and numbers, the CES provides an intersection "translating" the letters and numbers making up the code point "name" into "on" and "off"). Thus, each character is assigned a unique value, named so font designers know where to put which graphical representation. If the font chosen does not provide a visual for the code point, or the computer is unable to translate the CES of a file, empty squares or question marks will appear (Figure 4, page 22).

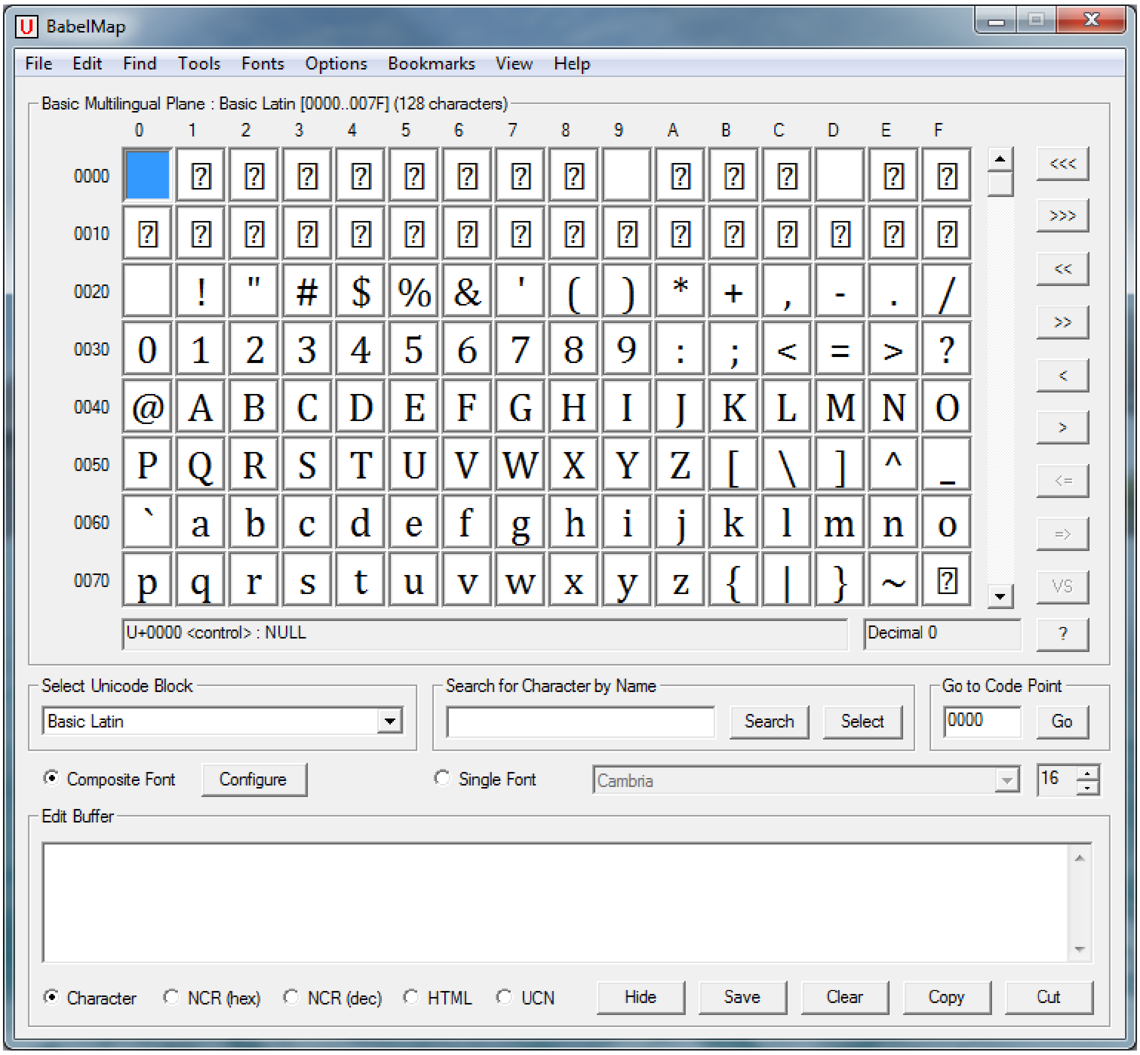


Figure 15. *Screenshot of BabelMap (West n.d. [a]), code block Basic Latin, font Cambria 5.97.*

Traditionally and to retain backwards compatibility, the first 200-something code slots of Western CES are reserved for the range of symbols from ASCII. As technology progressed and processing power increased, other scripts were gradually added to the new CES.

It is crucial to understand that Unicode *only* provides the unique identifier for a symbol/character and the required infrastructure for storing graphical representations of characters. The visual representation of a character is left to fonts and their designers (Section 3.3.2). As of today, version 15.0, Unicode provides 149,186 code points for an equal number of signs originating from 161 scripts, thus by far exceeding the visual representations that can be stored in font files, which frequently forces users to make use of different fonts for different scripts. Each script has its own code block, meaning a range of code points designated to housing signs from this script only. Since 1999 and version 3.0, Unicode also has a code block for runes, simply called “Runic”. It covers code point 16A0 to 16FF, with space for 96 characters, 89 of which are taken, leaving 7 empty code points for future additions. This code block and its range of signs will be the basis for the CES developed here.

3.3.2 Fonts, font design and character encoding standards

Since CES merely provide a framework by regulating which character is assigned which unique identifier, it is up to fonts to provide the character to display, by providing the scalable *image* attached to this unique identifier. Only this image is visible to users, yet regardless of the chosen font, the CES in the background ensures that the underlying code always stays the same. Users thus only choose a different way to *display* said code. To the computer, A continues to be 0041, whether it is displayed as A, A or ᛆ. Likewise, the binary string will continue to be 01000001 no matter the shape displayed. Fonts can therefore with justification be called nothing more than "dress(ed) code". The only instances where different characters will be displayed are those where a file is opened using the wrong character encoding (Figure 4). Most character encodings therefore strive to retain compatibility with other popular encodings by using the same code points for the same characters. Users only realise something is wrong if making use of the particular code points where there are differences.

This creates problems with using runic fonts in a DB. Table 74 exemplifies this using the two fonts *Gullskoen* and *Gullhornet,* both designed specifically for the Norwegian runic corpus editions in the late 1980s. At the time, the CES was still 8-bit ASCII, affording space only for 256 characters as a whole, opposed to UTF-8's 137,439. If runes were to be displayed on a computer screen, there was therefore no other choice but to use the code points available and replace the images of the characters supposed to be at particular code points with runes. Today, with code block Runic available in a variety of CES, this is not required any longer, yet several available younger runic fonts still do not make use of this code block, and continue to replace images. In documents (.doc, .docx, .odt) the potential harm is comparatively small, as it mainly results in annoyance on the user side when the Roman letters are presented instead. In a DB, making use of fonts using unique identifiers meant for Roman letters for runes has much more destructive consequences since the computer needs a consistent reference point to find any kind of information. This cannot work when the same code, for example 0041, actually encodes *two different pieces of information.* For example, if Gullskoen is used to represent the runes in an inscription in a DB, users searching ᛆ will also get all results for "A". This happens because the computer returns every record containing the code 0041 regardless of the graphical representation and Gullskoen is using the same unique identifier for a different graphical representation.

Obviously, this is not what users want. Some DBMS like MS Access support displaying different parts of a DB in a particular font. Theoretically, this approach could work if the tables were kept carefully apart and users were very conscious of what table they are running queries on. It does not solve the underlying problem though, that two very different pieces of information are connected to the same unique identifier. This also displays the whole table in the chosen font, including information that users would prefer to be able to read without deciphering runes. Moreover, it is not uncommon for Roman capital letters to appear in runic inscriptions as part of the text. As a matter of fact, the very first runic inscription on the Meldorf fibula may well be in Roman capitals rather than runes. It is impossible however to search for runic inscriptions without Roman capitals or runic inscriptions also containing Roman capitals if the computer doing the searching considers ᛉ as M. If runes are to be stored as machine-searchable text in a DB, the most sensible way to do so is therefore by utilising the Runic code block and its unique identifiers.

3.3.3 Code block Runic

(Digital) representation of runes must be discussed in advance of the creation of a runic DB, as no runic DB can be expected to answer the needs of runologists without being able to store the runes themselves, preferably in a way that enables runologists to search for and look up particular runes and variations thereof. This chapter therefore focuses on possible solutions to the issues the representation of runes in DBs creates. This requires a discussion of the issues with the current code block Runic in Unicode.

Seeing as the Older Futhark consists of only 24 characters, the Younger of 16 and the Anglo-Saxon Futhorc of 32, the 96 code slots allotted to Runic seem plenty. Yet a look at Table 75, an overview of the visual representations from two currently widely used fonts, the problems become evident; differences in how single runes are rendered are striking, but there is also a variety of issues with the choice of runes represented.

1. Range of signs

The range of signs ignores the fact that runes were not a standardised script, used in several different regions and with at least three major stages of development, not counting the Anglo-Saxon runes, which are nevertheless present in Unicode. Owing to this, none of the standardised rune rows as presented in runic handbooks is represented in full.

2. Misleading character designations

The character designations chosen would in more than one case be contested by runologists, such as “Icelandic yr”. Ascribing a particular type of rune to a specific region is uncertain business at best. Debates like the one conducted by Seim (1989) and Hagland (1988b, 1989) illuminate the problems clearly.

3. Imprecise naming conventions

Runes used to express different sounds after the collapse of the 24 signs of the Older into the 16-sign Younger Futhark do not reflect this in their name (16C1).

4. Lack of mirrored runes

Wenderunen are not considered, despite the fact that this is a fairly common phenomenon in especially older inscriptions. To correctly visually represent these runes, one is forced to use a differently coded sign, as is the case for ᛐ and ᛚ, ᚿ and ᛆ, ᛉ and ᛦ, thus confusing a machine-run search.

5. Duplication of runes

Runes used within different rune rows are coded as separate runes, although their visual representation is the same and used interchangeably (compare 16BD, 16C2 and 16C4).

6. Addition of very rare runes

Runes appearing at most two or three times within the whole runic corpus like runes from the Franks Casket are included, taking up code points that could have been assigned to more common variations. Table 75 also shows that while these runes have been added, no font designer has yet created a visual representation for those, nor for K, SH and OO.

Overall, there appears to be little consistency in why runes were chosen/left out, although the choices were by no means haphazardly made (Lundström 1995). The details of the genesis of code block Runic cannot be delved into here, as this would warrant another chapter of its own; suffice it to say that the problem is rooted in a lack of an overarching concept of how to present runes digitally (Magin & Smith 2023). This does not provide the best premise for proper encoding of runic characters in a DB, and it becomes very clear why the choice of the right tools plays such an important role in digitisation projects and has so much influence on the end product. At this stage, the question is if this, one may call it haphazard, collection of runes in Unicode is the alternative to using a bespoke runic font, is it not better to use the font and find solutions for the technical problems going with this?

In the short run and in comparatively small projects, using several different fonts to represent different variations of runes may work fairly well. It does not work on a larger scale owing to the unfortunate combination of peculiarities on the side of runic script and the technological requirements on the other. But there are different levels of standardisation of runic signs (Section 3.2), and based on these different levels of standardisation, it is possible to find common ground between runes on the one and computers on the other side. It necessitates a short discussion of the levels of abstraction involved in the standardisation of runes.

3.3.4 Runes, graphemes and standardisation

The same peculiarities making runes so difficult to machine-code, unfortunately also render it almost impossible to conduct large-scale examinations looking for patterns to provide better suggestions for how it could be done. Studies of rune shapes often attempt to discern whether variations in the way the same "basic" rune shape is carved also represent a difference in pronunciation. Seim (1998) already points out that to worry about how to transliterate a rune means to prejudice what should in the first instance be an objective representation of an observable sign. Following Dyvik (1996), she argues in favour of keeping the two levels of analysis apart by first establishing a typology based on rune shapes and then developing a consistent transliteration system based on it (Seim 1998: 22-23) and mentions the possibility of using this system in order to encode rune shapes for a medium unable to store runes proper. Published a year before Runic was included in Unicode 3.0, her wish may well stem from issues experienced while using runefonts. She rejects a system using random signs or numbers to indicate the rune shape (Spurkland 1991) and instead opts to provide information about common shapes by using Roman capitals in her transliteration while acknowledging that this will only indicate two out of any number of shapes (Seim 1998: 23, 26).

To a certain extent, the solution I developed for the purpose of properly representing variation in rune shape follows the idea of a consistent transliteration system, although I would hesitate to consider it a proper typology. Comparing the range of characters in Table 74 to that in Table 75, it is obvious that the Gullskoen and Gullhornet fonts contain more characters than the 96 code slots in the Runic code block can accommodate (Gullskoen stores 154, Gullhornet 121 glyphs; numbers based on Babelmap's information tool). This wealth of graphical representations is owed to the standardisation of actual runes into "print runes" or "ideal runes" being undertaken with varying levels of abstraction, each of which depends on how many of the graphic features of actual runes are considered relevant, similar to developing an artefact typology. In fact, Spurkland (1991) and Seim (1982, 1998) both attempted to develop a rune typology based solely on graphic features for the Bergen inscriptions. Other graphemic analyses focus on different corpora, for example Nowak (2003) on the Migration period bracteate inscriptions or Waldispühl (2013: 71-73) on the South Germanic inscriptions in the Older Futhark, where she presents one possible approach (Seim 1998: 31-32, 51 uses "rune", "runetype" and "idealrune" for similar concepts), defining the different levels of abstraction as

- Graph (*graph*): the actual sign;
- Graphtyp (*graphtype*): a group of Graphen resembling each other but notably distinct from other groups; formal characteristics need to be generalised in order to form these groups;
- Graphtypenklasse (*graphtype class*): a yet more generalised group of Graphtypen showing similar characteristics; it can include one or more different Graphtypen.

By this definition, any font by default operates on the level of Graphtypen or Graphtypenklassen simply because no runic font, to my knowledge, attempts to represent every single rune shape within a corpus. It would be a pointless endeavour, too; Graphe are the equivalent of handwritten Roman letters. In contrast, the range of characters in the Unicode code block Runic – with a few exceptions – is designed to accommodate Graphtypenklassen rather than Graphtypen. This is not surprising since character encodings do not encode shape variations of characters from other scripts either, and it would be both inconsistent and pointless to treat runes differently, given that variations of the character's shape are supposed to be provided by different fonts.

This theoretical foundation provides a basic framework for judging the different levels of abstraction of digital representations of runes. It does not solve the runologists' dilemma of being unable to store different Graphtypen while retaining uniqueness for encoding purposes, though. Another intersection between font and character encoding is required.

3.4 Encoding runes and their variations

Code block Runic has proven largely unusable for the purposes of graphemic research into runic writing; fonts are problematic in terms of reliable data retrieval; runologists are used to being provided with additional information encoded visually in transrunifications. On the other hand, there are computers with their binary encoding and all this entails. A system equally satisfactory for the human and the computer side needs to:

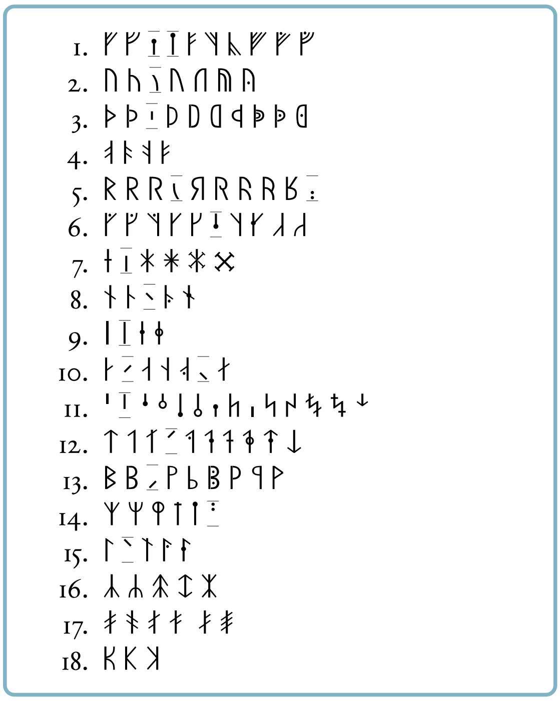
- permit a search for all Graphe from one (or more) Graphtypenklasse(n)
- permit a search for all Graphe from one (or more) Graphtyp(en)
- allow those runes to be traced back to the object(s) they appear on
- use a minimum amount of code
- be consistent in how different variations (like rounded/un-rounded pockets) are coded
- be based on Unicode as the current main CES
- allow for events such as uncertainty in identifying the proper Graphtyp, damaged runes, lacunae that frequently appear in runic inscriptions.

The Runic code block must for several reasons provide the basis. The Bergen inscriptions, being the example corpus for this project, will serve as the data to be encoded. They conveniently have their own bespoke font, which will be used to exemplify how variations of runes can be encoded using the Runic code block without having to resort to using other characters' slots.

3.4.1 Determining the runic variation range

The Gullskoen font contains 154 glyphs, exceeding the 96 character range of the Runic code block by 48 code points; it offers several different variations of the same rune, including Wenderunen. One possible solution is to map the glyphs from Gullskoen onto the Runic code points. Doing so would however create a similar problem as mapping them onto the code points reserved for Roman letters. Additionally, 48 glyphs from Gullskoen would have to be excluded, rendering the whole endeavour somewhat pointless. As the first step in creating an intersection between Gullskoen and the code points provided by Unicode, the Graphtypen represented in the font therefore need to be sorted into the larger, more abstract category of Graphtypenklassen, allowing each Graphtyp to be represented by the overarching Graphtypenklasse. During this process, it is important to account for the following features of runic writing: Graphtypen which, when mirrored, equal another Graphtyp and Graphtypen which might belong to more than one Graphtypenklasse.

Instead of using the approach that Seim (1998: 59-70) took, the approach chosen here is closer to Waldispühl (2013). Based in part on visual features and in part on the ascribed sound value, the whole range of the Gullskoen Graphtypen is grouped into 18 Graphtypenklassen, in turn tied to what Seim refers to as "futhark-enhet". The framework is provided by Haugen (2000), which states that the choice of which Graphtypen to turn into font characters was loosely based on Seim (1982), but the font itself is not meant to present any kind of typological survey over the Bergen runes. The single characters are instead listed in alphabetical order and the respective runic subsystems they appear in, including which sound value they supposedly represent (Table 76). Below, they are presented already grouped into the 18 Graphtypenklassen:



Visual features were for the most part the deciding factor when sorting the runes into Graphtypenklassen. The distribution of the different shapes into these 18 groups can certainly be contended on varying grounds; however, there is no logic in assigning A the unique identifier 0041 either. This grouping merely serves as a basis, the only crucial requirement being that each Graphtyp only sorts into one Graphtypenklasse.

3.4.2 Determining the code point range

Once the Graphtypen have been assigned one Graphtypenklasse, the Unicode code point in the Runic code block representing each Graphtypenklasse needs to be chosen. Technically, it does not matter which code point is chosen as long as the rune represented by the code point is in the Graphtypenklasse it is supposed to represent. Nevertheless, some considerations were taken into account given the issues afflicting the code block Runic. For example, an explicit choice was made against using one of the medieval rune rows (long-branch or short-twig), since rune rows are variations of the underlying Futhark. Where possible, a code point with a neutral description was therefore preferred to a code point referring to a specific runic subsystem. However, in cases where the code point description references the Older Futhark (and is visually represented as a rune ascribed to the older period in more than one font), a code point referencing one of the younger subsystems was chosen. This decision was however mainly motivated by the dating of the Bergen inscriptions. Following this, a complete 16-character-rune row can be put together:

1. 16A0 RUNIC LETTER FEHU FEOH FE F
2. 16A2 RUNIC LETTER URUZ UR U
3. 16A6 RUNIC LETTER THURISAZ THURS THORN
4. 16AE RUNIC LETTER O
5. 16B1 RUNIC LETTER RAIDO RAD REID R
6. 16B4 RUNIC LETTER KAUN K
7. 16BC RUNIC LETTER LONG-BRANCH-HAGALL H
8. 16BF RUNIC LETTER SHORT-TWIG-NAUD N
9. 16C1 RUNIC LETTER ISAZ IS ISS I
10. 16C6 RUNIC LETTER SHORT-TWIG-AR A
11. 16CC RUNIC LETTER SHORT-TWIG-SOL S
12. 16D0 RUNIC LETTER SHORT-TWIG-TYR T
13. 16D2 RUNIC LETTER BERKANAN BEORC BJARKAN B
14. 16D8 RUNIC LETTER LONG-BRANCH-MADR M
15. 16DA RUNIC LETTER LAUKAZ LAGU LOGR L
16. 16E3 RUNIC LETTER CALC
17. 16AF RUNIC LETTER OE
18. 16D5 RUNIC LETTER OPEN-P

With Graphtypen sorted into Graphtypenklassen and the main code point reference for each group chosen from Runic, it is now possible to modify the system to represent shape variations within a DB.

3.4.3 A potential Rune Encoding Standard

At this stage, it is possible to represent the Graphtypenklassen by using this system, but not the Graphtyp. To retain this option, the code point representing the Graphtypenklasse needs to be combined with a second code point indicating the Graphtyp. The easiest solution was to adopt a numerical system. In practice, the whole system is designed as a matrix like other CES: the vertical axis provides the Graphtypenklasse, while the horizontal axis provides the Graphtyp-digit (Table 4). Since some Graphtypenklassen contain more than 9 Graphtypen, two digits were allotted to the Graphtyp. Being consistent in the number of characters used for encoding a particular item is a technical necessity. If some of the runes are only encoded by two signs, others by three, running queries becomes more difficult, as one then needs to take into account that the Graphtypenklasse-rune can be followed by either one or two spaces

Unicode		99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
16A0	ᚠ	ᚠ99	ᚠ00	ᚠ01	ᚠ02	ᚠ03	ᚠ04	ᚠ05	ᚠ06	ᚠ07	ᚠ08	ᚠ09	ᚠ10				
16A2	ᚢ	ᚢ99	ᚢ00	ᚢ01	ᚢ02	ᚢ03	ᚢ04	ᚢ05	ᚢ06	ᚢ07							
16A6	ᚦ	ᚦ99	ᚦ00	ᚦ01	ᚦ02	ᚦ03	ᚦ04	ᚦ05	ᚦ06	ᚦ07	ᚦ08	ᚦ09	ᚦ10				
16AE	ᚮ	ᚮ99	ᚮ00	ᚮ01	ᚮ02	ᚮ03	ᚮ04										
16B1	ᚱ	ᚱ99	ᚱ00	ᚱ01	ᚱ02	ᚱ03	ᚱ04	ᚱ05	ᚱ06	ᚱ07	ᚱ08	ᚱ09	ᚱ10				
16B4	ᚴ	ᚴ99	ᚴ00	ᚴ01	ᚴ02	ᚴ03	ᚴ04	ᚴ05	ᚴ06	ᚴ07	ᚴ08	ᚴ09	ᚴ10				
16BC	ᚼ	ᚼ99	ᚼ00	ᚼ01	ᚼ02	ᚼ03	ᚼ04	ᚼ05	ᚼ06								
16BF	ᚿ	ᚿ99	ᚿ00	ᚿ01	ᚿ02	ᚿ03	ᚿ04	ᚿ05									
16C1	ᛁ	ᛁ99	ᛁ00	ᛁ01	ᛁ02	ᛁ03	ᛁ04										
16C6	ᛆ	ᛆ99	ᛆ00	ᛆ01	ᛆ02	ᛆ03	ᛆ04	ᛆ05	ᛆ06	ᛆ07							
16CC	ᛌ	ᛌ99	ᛌ00	ᛌ01	ᛌ02	ᛌ03	ᛌ04	ᛌ05	ᛌ06	ᛌ07	ᛌ08	ᛌ09	ᛌ10	ᛌ11	ᛌ12	ᛌ13	ᛌ14
16D0	ᛐ	ᛐ99	ᛐ00	ᛐ01	ᛐ02	ᛐ03	ᛐ04	ᛐ05	ᛐ06	ᛐ07	ᛐ08	ᛐ09	ᛐ10				
16D2	ᛒ	ᛒ99	ᛒ00	ᛒ01	ᛒ02	ᛒ03	ᛒ04	ᛒ05	ᛒ06	ᛒ07	ᛒ08	ᛒ09					
16D8	ᛘ	ᛘ99	ᛘ00	ᛘ01	ᛘ02	ᛘ03	ᛘ04	ᛘ05	ᛘ06								
16DA	ᛚ	ᛚ99	ᛚ00	ᛚ01	ᛚ02	ᛚ03	ᛚ04	ᛚ05									
16E3	ᛣ	ᛣ99	ᛣ00	ᛣ01	ᛣ02	ᛣ03	ᛣ04	ᛣ05									
16AF	ᚯ	ᚯ99	ᚯ00	ᚯ01	ᚯ02	ᚯ03	ᚯ04	ᚯ05	ᚯ06	ᚯ07							
16D5	ᛕ	ᛕ99	ᛕ00	ᛕ01	ᛕ02	ᛕ03											

Table 4. *Rune variation encoding table.*

(Section 4.7.3). This approach also has the benefit of leaving some 90 code points for potential future additions to the system. Graphtypen were added to the groups as they appear on the character map, with the exception of two particular numerical codes: 00 and 99. 00 signifies a Graphtyp so far not represented in Gullskoen, while 99 (in accordance with common practice in statistical evaluations) was set aside as a reserved code. Potential uses of the 99-code could include: reconstructed rune (commonly indicated by brackets in transliterations, Figure 14) or no classification possible.

Using this composite code point method, it is now possible to uniquely identify not only Graphtypenklassen, but Graphtypen. Figure 12, for example, becomes the following string of characters (disregarding the diacritic markers and brackets):

> ᚠ01 ᚢ01 ᚦ08 ᚮ01 ᚱ02 ᚴ04 ᚼ03 ᚮ03 ᛁ01 ᛌ01 ???
> ᛚ01 ᛒ02 ??? ᛣ01

Each rune is represented by three characters: one rune from the Runic code block, indicating the identified Graphtypenklasse, and two digits indicating its Graphtyp. Either information is encoded by symbols with a unique identifier not used to also represent a different sign. This enables the computer to identify, for example when querying a DB, the single instances for each of those symbols. This way, it is both possible to only query for the Graphtypenklasse (by querying for the rune) or to specify which Graphtyp the rune should be. In the second case, the computer will look for this particular string of characters and return all results with this combination. Unidentified runes, too, are represented by three ? for encoding consistency. This is already a vast improvement over using a font or the Runic code block by itself. There can be no misunderstandings about which graphical representation users are looking for, yet it is possible to also represent variations of rune-shapes that the range of Runic would not permit representing. The system can, however, be expanded beyond that to also represent the additional information traditional, printed transrunifications often include: the doubts, uncertainties, mirrored and bind-runes indicated by dots and character ties.

3.4.4 Encoding doubts, uncertainties, mirror and bind-runes

Including print conventions encoding certain scholarly judgements concerning a rune (Section 3.2) in a digital representation of an inscription would be convenient; it is not as easy to encode them. Character and ligature ties as well as the dot below are specific types of characters, housed in the "combining diacritic markers" and "general punctuation" blocks. Their special properties allow them to modify the other characters situated around them, and displayed it looks like they are added on top of these. In code, however, they are inserted in between the unique identifiers of the other characters, making them singularly unsuitable for use in the coding system proposed here. They would have to be added after the Graphtyp number of the preceding and Graphtypenklasse rune of the following rune. Displayed, the character/ligature tie would then tie the last digit of the Graphtyp and the rune of the following Graphtypenklasse together, which does not make much sense. There is also the question to which character in the sequence the dot should be added. Theoretically, an encoding system like the one presented could work on the same principle as printed transrunifications and simply attach the diacritic marker to the Graphtypenklasse rune. But it should be considered here as well that there are at least four possible meanings to the dot below (cf. Section 3.2). These are:

1. Graphtypenklasse identified, Graphtyp identified (in which case the dot is absent)
2. Graphtypenklasse identified, Graphtyp doubtful
3. Graphtypenklasse doubtful, Graphtyp identified
4. Graphtypenklasse doubtful, Graphtyp doubtful

Option 3 should be understood to mean "if Graphtypenklasse is x, then Graphtyp must be y" rather than "the Graphtypenklasse cannot be identified, but the Graphtyp can", which is illogical. In a publication, only the description clarifies which of the above cases the dot signifies in any given instance, or if it is supposed to indicate a surprising rune at a surprising position in an inscription.

The unclear meaning of the dot is an argument against sticking to this convention, not to mention the technical issues. There is another option though. Instead of expanding the code for only the doubtful Graphen, the code is expanded for all runes to include determination letters (DL), and not only one, but two of them, one assigned to the Graphtypenklasse rune and the second to the Graphtyp number. This way, it is even possible to encode the distinctions enumerated above without having to resort to a verbal description, and by attaching the DL marker to both parts of the alphanumerical code, there can be no doubts about which part of the identification it refers to. The characters chosen for this purpose would preferably be within the ASCII range, but never used in any runic inscription known. The choice was therefore made to use the Roman letters "a" and "b", which fulfil both criteria. "a" serves as the marker for "identified", "b" as the marker for "doubtful". The complete code string for one rune in an inscription therefore looks like:

> GR – DLR – GN – DLG
>
> GR = Graphtypenklasse Rune, DLR = Determination Letter Rune, GN = Graph Number, DLG = Determination Letter Graph.

This brings the number of code points for encoding a single Graph up to five, which is admittedly cumbersome. Yet while the representation is not as immediately obvious as in printed editions, the system manages to encode all of the pertinent information, even at a higher level of specificity (since the uncertainty can be directly pinned to the debatable aspect at two different levels). For my test runs, I decided to make use of the five-alphanumerical-system; if that level of detail is not required, however, a three-alphanumerical-system is sufficient to express the graphic variations of runes.

There are, however, three peculiarities of runic script which still present difficulties, also in this system, runic punctuation, Wenderunen and bind-runes. So far, neither has a consistent representation in any font, nor in Unicode, although Wenderunen can theoretically be displayed by simply using the corresponding visual representation, which creates a problem with using the same symbol for two different signs.

Of these three peculiarities, runic punctuation (which is not the same as Roman punctuation) was the easiest to encode. Applying the same principle as with the runes, I chose three code points from Runic and added numbers to the various punctuation marks (Table 5).

As far as bind-runes are concerned, I chose to use a symbol that does not appear in runic inscriptions to signify that two or three runes occur as a bind-rune: ¹, also known as Superscript One or U+00B9. Instead of insinuating itself on top or below the neighbouring characters, ¹ is recognisably different and easy enough to spot, as well as to query for. It is inserted between the DLG of the preceding rune and the GR of the following rune, for example in:

> ᛆa03a¹ᚢa04aᛁa03aᛉa01aᛆa03a¹ᚱa02aᛁa01aᛆa03a

This is one example from the 176 Bergen inscriptions I encoded to test this system, predominantly from *NIYR VI* and Seim (1998). Admittedly, in terms of a proper visual representation of the original Graph, it lacks the clarity of a font or a printed transrunification. Yet while I lacked the time and technical skills, it is possible to program a GUI that translates these character strings and the information they encode into visual representations like transrunifications in print. Additionally, I considered it more desirable to be able to encode the information than to be shown a perfect visual representation of a rune, especially since the flexibility of this encoding system allows the user, for example, to examine N-grams, determine frequencies of certain variations within a given corpus and in general, conduct pattern analyses on runes and their varying shapes. In the end, there was not enough time left to actually make use of the possibilities this encoding system offers, nor to properly address remaining issues. But this proves that it is by no means impossible to turn runic Graphen into machine-readable and -searchable text, which by itself opens up completely new opportunities for research into runic variations and use.

One last encoding problem still remains: Wenderunen. To understand why they constitute such an issue, the most common way of representing runes in print publications needs to be discussed.

3.4.5 *Transliterating as a method of representing runes*

"Transliteration" describes the process of rendering the signs of one writing system into those of another, in this case runes into Roman letters (Seim 1998: 20). Since the shape of the signs can be vastly different, the common denominator between the two scripts tends to be the sound value(s) each sign is connected to, often referred to as phoneme. Yet no two writing systems are perfectly aligned, as each of them was developed to satisfy the demands of a specific language. There is therefore always the question of which speech sound in one language corresponds to which speech sound in another language, and by extension, sign. This is usually referred to as grapheme-phoneme relationship. Since transrunifications can be unsatisfying

Unicode			00	01	02	03	04	05
16EB	RUNIC SINGLE PUNCTUATION	·		·				
			·00	·01	·02	·03	·04	·05
16EC	RUNIC MULTIPLE PUNCTUATION	:		:	⋮	⋮	·:·	·⁝·
			:00	:01	:02	:03	:04	:05
16ED	RUNIC CROSS PUNCTUATION	+		+				
			+00	+01	+02	+03	+04	+05

Table 5. *Runic punctuation encoding table.*

despite best efforts, many scholars resort to immediately transliterating the runes into Roman letters (Seim 1998: 20). Spurkland (2005: 17) in fact recommends it for “everyone can read what we are reading in the inscription.”

Runic DBs, as well, have so far refrained from representing runes, certainly in part due to encoding issues.[2] Convenient though this solution may seem, it is has severe drawbacks. Linking two signs from different writing systems together by means of the common denominator “phoneme” is difficult enough, but considering the time span and the wide geographic distribution of runic inscriptions as well as the language changes taking place, it is not unreasonable to expect that the use of single signs for specific sound values varied (as it does in modern languages using Roman script).

The emergence of no less than three different systems from the Younger Futhark only compounds the problem, as some runes within rune row encode a different sound value in another. Most importantly, the phoneme paired with a rune is to some extent an unknown factor seeing as there are no living speakers of any of the languages represented in runic inscriptions. Rune-phoneme relationships are based on written sources about OWN pronunciation, mainly the *First Grammatical Treatise,* and reconstructed sound values (Düwel 2008: 197-202; Spurkland 2005: 6, 10). This was written in Iceland sometime during the 12th century; strictly speaking, it can therefore only be regarded as reliable for the rune-phoneme relationships of that time, not necessarily the earlier systems, although it is for the most part accepted as a general reference point for other periods as well. Its authority is reinforced by rune poems listing all known runes with a word, the first sound of which corresponds to the phoneme of the rune, the “acrophonic principle” (Düwel 2008: 197-202).

Even if one accepts the pronunciation described in the *First Grammatical Treatise,* the rune-phoneme relationship does not always correspond to the Roman letter-phoneme relationship, partly because runes were designed for use in a different language, which made use of phonemes that do not occur in ancient Latin, and instead drops some that do. Secondly, even when the relationship corresponds to some extent, like ᚢ and **u** both expressing the sound /u/, the development of runic writing over time changed the sign repertoire drastically, resulting in ᚢ at different stages in time representing every sound from /u/ to /o/, /y/, /w/, /v/, and in some cases even /f/. Lastly, since runes as a script have gone out of use, the reconstruction of rune-phoneme relationships by scholars can be and occasionally is fiercely debated: “[...] a discus-

[2] This does not mean that the additional information encoded in transrunifications gets lost; uncertainty in transliterations is marked in the same fashion as in transrunifications, see Thompson (1981). Unlike transrunifications, transliterations are usually printed in bold lettering (Seim 2013: 153; for exceptions see Thompson 1981: 91). Caution needs to be exercised however; a dot underneath a transliterated Roman letter may also signify that the scholar is doubtful whether the rune should be transliterated with this Roman letter.

sion of the interpretation of a runic inscription will very often turn on the relationship between sign and phoneme. The question often boils down to this: what phoneme can justifiably be identified with a particular rune in a given circumstance?" (Spurkland 2005: 18).

There is no intrinsic relationship between Roman letters and the sound(s) they represent either; readers of runological publications have to be familiar with the different native languages of the scholars in order to correctly reconstruct the speech sound in question. In many cases, there is not much of a problem since runologists tend to originate from Germanic-speaking countries with similar pronunciation. Still, these problems should not be underestimated and scholars like Seim (1998) and Spurkland (1991) have uttered criticism and attempted to provide a more reliable framework for a transliteration system based on rune shapes instead of probable sound values (Seim 1998: 20). The last attempt to codify the transliteration process to a greater extent was undertaken by the CAS project in Oslo in 2013-14, but no result has been published yet. The crux of the matter is, of course, that to get at the meaning of a runic inscription, runologists have to establish which words are used in the text, and how they relate to each other. The reference frame used to decode these messages are (partly) reconstructed languages, most of which rely on a complicated system of sound changes indicating how the words in a sentence relate to each other (still prevalent in modern Icelandic and German; sound changes are also still present in modern English, for example in irregular verbs). Since very little is known for sure about the actual pronunciation of these reconstructed languages, scholars tend to rely on the spelling – which in turn tends to rely on how said words are spelled in manuscripts. These, with very few exceptions, use Roman script. To compare the spelling between manuscript and runic inscription and decode the sign sequence in question, one or the other therefore needs to be transliterated into the respective other system.

Changes in the runic script itself as well as in the use of its repertoire of signs and the incompatibility issues between runic and Roman script are good reasons for runologists to base analyses on an examination of the original signs, respectively the combination of them within a given inscription. Considering that specific runes are treated as indicators for changes in the writing system, changes in the grapheme-phoneme relationships and are also in some cases suspected to be connected to "schools" of runic writing or regional traditions (Antonsen 1975: 6; Barnes 2012: 19; Düwel 2008: 15), tracking a specific rune and its variants through the whole runic corpus in order to establish its geographic and chronological distribution becomes a matter of scholarly interest (Düwel 2008: 94). In fact, since the interpretation and dating of an inscription may well hinge on the runes and their combination, this is of extreme importance to scholars since "rune-carvers were somewhat remiss in dating their inscriptions" (Spurkland 2005: 132).

At first glance, the problem of runes being used several times in different scripts, but signifying to the best of current scholarly knowledge different sounds, is a very different problem than the representation of Wenderunen. At the level of encoding, it is not. Runes are, in a way, unique identifiers for speech sounds, so if one and the same rune can be used to express several different speech sounds, from the point of view of encoding, there is a problem. Wenderunen are a problem exactly because the same graphical representation can potentially signify two different sounds: ᛏ and ᛚ, depending on interpretation, can be transliterated as either /t/ or /l/, and the same applies to several other runes. At the level of geometric shape, a Wenderune may look like another rune. Still, it is not the same symbol and being able to encode that information as well could potentially prove important. Using the current rune character encoding, this is not possible in transrunifications. Neither is it possible to properly encode that some runes have changed their sound value over the course of time, or that they, by default, can represent several different speech sounds.

The question needs to be asked, however, of whether it is really necessary to *also* encode potential sound value in transrunifications, considering the graphical representation already has to represent Graphtypenklasse, Graphtyp and, in the five-alphanumerical-system, interpretational specifics. There is only so much information a graphical

Unicode		Overlap		
16A0	ᚠ	ᚢ	ᚴ	
		ᚢ07	ᚴ02	
16A6	ᚦ	ᛑ		
		ᚴ10		
16BC	ᚼ	ᛄ	ᛂ	
		ᛁ04	ᛁ03	
16C1	ᛁ	ᛁ		
		ᚼ01		
16C6	ᛆ	ᛆ	ᚼ	ᛅ
		ᛆ03	ᛆ02	ᚴ09
16D2	ᛒ	ᚠ		
		ᛆ04		
16D8	ᛘ	ᛦ	ᛦ	
		ᛦ01	ᛦ02	
16E3	ᛣ	ᚢ		
		ᚢ07		

Table 6. *Multivalued rune-shapes.*

representation can be expected to carry and since transliterations anyway already serve to represent the assumed sound value of the rune in question, encoding it again in transrunifications seems rather like a waste of time. Additionally, it is only at the level of interpretation represented by transliterations that sound value even becomes important. Before that, a rune is a graphical representation of an as-of-yet indeterminate speech sound – this applies to multivalued as well as Wenderunen. I therefore made the decision to not create specific code points for Wenderunen looking like other Graphtypen in my encoding system, instead relying on the RDBMS's ability to query for information from more than one table. In other words, and as Chapter 4 will show, it is entirely possible to query the DB for an inscription which shows, for example, ᛚ in its transrunification, but transliterates this specific rune as **l**. This necessitates an extra level of complexity in query formulation; yet the whole point of encoding rune variations at all was to be able to find all inscriptions in which a certain graphical representation appears with comparatively little effort on the side of the runologist and to provide them with the best equivalent of a graphical representation possible. It is hardly unreasonable to expect that they then take a closer look at the result set and make an informed judgement about whether specific occurrences are Wenderunen. To render matters less complicated, I have however noted down which runes from the Bryggen corpus have a tendency to signify a different sound value than the one their Graphtypenklasse generally implies (Table 6), so that it is easier to find them in Table 4.

With this issue resolved, it should be clear how the runes and their varying shapes were encoded for use in this project and how the technological limitations have shaped the solution. The next step is to start modelling the rest of the data that no runologist can work without.

4 Core database design

As outlined in Section 2.2, previous DBs, although they rely on transliterations to represent inscriptions digitally, modelled their content in different ways. Building upon that, this chapter strives to combine the benefits and eliminate the drawbacks of past approaches, if possible. Yet analysing every single structural decision made in prior DBs is not the aim either; the chapter focuses instead on modelling the data resulting from the first step in Düwel's list (Section 2.2), script-internal considerations, and more precisely, modelling the process from text on object to normalised text. By doing so, it is possible to develop a generic, all-purpose model of a runic DB, which can later be expanded as different research questions demand.

Chapter 3 explains how the actual runes can be represented in a DB, the digital equivalent of the transrunification process. Transliteration and normalisation are the next important steps (Section 3.2); Section 2.2 outlines how existing DBs model these steps: Rundatabas uses different files to store transliterations and normalisations, whereas KDB and RFB keep them in the same table/spreadsheet in separate columns. While Rundatabas is therefore the most flexible, its drawback is that it most often only offers a single transliteration/normalisation, while KDB aimed to store several. The possibility to store more than one interpretation is an important factor (Section 2.3), since the question of the "right" interpretation of an inscription can, in many cases, never be answered with finality. The new model therefore needs to combine the flexibility of Rundatabas with the wealth of data found in KDB. This requires analysing the ontological relationships between these pieces of data, best by conducting an in-depth analysis of how runologists actually arrive at their interpretations.

4.1 Databases as a tool for runologists

RDBMS are highly customisable and flexible tools and in many ways, a relational scholarly DB is a constantly expanding digital note book making use of advanced cross-referencing, tagging and information tracking, enabled by structures conforming to relational theory. Other applications like GIS can use this structured data, thus opening up further possibilities of analysis; it also permits different levels and stages of analysis (micro/macro). The flexibility of the system depends on the data structure, though, and the reason why Rundatabas is currently the best all-purpose runic DB is that for the most part, it most closely follows the principles underlying RDBMS (Section 2.2.1).

4.2 The underlying principles of relational databases

DBs are built to provide information about a domain (Ramsay 2004: 179). There is never just one piece of information at the heart of this domain, instead it is an interconnected network of information with ontological relationships. To properly represent these, RDBMS follow certain principles, which in turn impact on:

1. how data is structured as tables (relations);
2. how the data in the tables creates relationships;
3. how the data is handled using these relationships.

The concept of relational DBs is based on set theory (Harrington 2009: 85-86). Venn diagrams are often used to visualise the formulae and in very simple terms, it is about collections of objects defined by and sorted into different sets by their attributes. Sets can overlap (attribute applies to some objects in one collection plus some in another), but do not have to (attribute only applies to objects in one collection). Mathematically, these can be expressed by

$$A \cap B$$
$$A \not\cap B$$

Following this concept, items (entities) to be stored in a relational DB are grouped into sets of data (entity types), which overlap completely, in part or not at all, which in turn defines their relationships to each other. Ramsay (2004) uses authors, books and publishers as an example; the problem with academic research data is generally that there are many ways of grouping items into sets and the choice defines what can be done later with the data. In DB design, the process of establishing these sets is referred to as entity modelling, since the items are referred to as entities and their sets as entity types.

4.3 Database design: entity modelling

In principle, entity modelling only means drafting a schema showing all information to be stored in the DB, including how the different kinds of information interact with each other. Yet it is exactly the combination of "all information" and "how does it interact" that requires examining how the different aspects of one domain relate to each other, a process called "entity-relationship analysis". The functional relationships between these aspects reveal what the entity model can look like and how the different entity types (sets, groups) are to be connected, for example: *written by, published by, work with* express the ontological relationships between authors, books and publishers (Ramsay 2004). In the entity model, they represent a mini-world relevant to the user, who might want to examine, for example, the publishing history of several famous works of fiction. Thus the entity model provides a conceptual overview of how different aspects of data relate to each other in the real world. This conceptual schema is then mapped into relations in the DB by determining which data counts as one set and what information about the single items is required for the research planned. In the last step, the DB is created using an RDBMS to define specifications of relations and field types, which will hold the actual data. Once finished, the RDBMS can then be used to extract information about single pieces or larger sets of data.

Yet depending on what one is trying to do, entity models can look very different. For example, in Rundatabas, the different entity types are represented by the files the DBMS relies upon. RUNDATA.RUN, containing transliterations, is an entity type distinguished from RUNDATA.NFS and RUNDATA.FVN by some feature that all its entities share, but that none of the contents of RUNDATA.NFS and RUNDATA.FVN share – in this case, transliterations are distinguished from normalisations by virtue of not being orthographically normalised. In KDB, transliterations, normalisations and translations (RUNDATA.ENG in Rundatabas) are all stored in *Interpretations*. They are distinguished by being stored in different columns, but being stored in the same table, from a data structure point of view, they are attributes of an interpretation instead of separate entities distinguished by their attributes.

To determine which structure works better for the resulting data, the following section examines how those different pieces of data come into existence.

4.4 Basic considerations for a relational runic database

Usually, runic inscriptions are carved into a carrier of some kind, an object. Object and inscription are, however, distinct, not least for the reason that the object may well carry more than one inscription, one and the same inscription may be found on more than one object, or continue on another object (although that is usually only the case when the original carrier has been damaged and broken). "Object" and "inscription" are therefore neither synonymous nor may they be regarded as the same entity type. It is at the definition of "inscription" though that entity modelling first becomes difficult since there is a long-standing debate between runologists about what an inscription is:

> Sometimes in runological literature the term "inscription" describes one actual row of runes which are considered to "belong together", meaning that one or more lines or statements are considered an entity, and are seen as having been carved at the same time. One object can thus be said to show several inscriptions. [...] The assumption that one object carries several inscriptions presupposes that the runic sequences are at least physically divided from each other, often also that they must be individual inscriptions, according to other indicators like the types of runes used or different carving methods. Sometimes, however, the term is used for all runes on one object which may well be physically separated, without regard to whether or

> not they have been carved at the same time or belong together (Seim 1998: 10-11, my translation).

Deciding on a case-by-case basis is not an option, in part because it would anticipate the actual interpretation of the text, something which should follow, not precede the mere factual entry in the DB: "Vi skiller mellom det å *lese* en innskrift og å *tolke* den. Det er to ulike prosesser som det er viktig å holde fra hverandre" (Seim 2013). But moreso, it is a structural problem from an entity modelling perspective. There are frequently many possible readings of an inscription, including conflicting opinions on whether there are one or more "inscription(s)" on the same object. For the sake of clear data structures, there needs to be a common point of reference each part of an inscription can be linked to, whether it is a continuous flow of text or different texts coincidentally assembled on the same object. Yet using the object itself is problematic as well. Broken objects, even when they clearly used to be one, may have been assigned different inventory numbers before researchers realised they belonged together, thus requiring a decision which inventory number should be used as the unique identifier. More importantly, they may also have been found in different contexts, which in turn impacts on spatial analyses, so retaining their unique identifiers is important for analyses. The Bryggen objects, for example, to a large degree share the same overarching inventory number, but the single pieces of a broken object are numbered by themselves and ultimately stored as single items (see Section 4.8.1).

In this case, modelling reality is difficult, at least when the interpretation is taken into account. But the actual reality looks like this: objects are physically distinct; if they once were part of the same entity, they belong together, which can be expressed by introducing an entity type representing the object as a whole, marked by a unique identifier, while the parts of it are stored in a different entity type with their own unique identifiers. The ontological relationship between those two entity types is then: "pieces x, z belonged to object y" or "object y consisted of pieces x, z"; this would only have applied to one object and was therefore not put into practice.

Where inscriptions are concerned, determining the number of textual entities on an object is very much part of the interpretation process. The physical reality is that even if there are three distinct texts, they are still on the same object. "Inscription", at this stage of entity modelling, is therefore defined as "every rune on an object" and is considered distinct from textual entities, which are reunited or separated at a much later stage of the process (Section 6.2.6).

4.5 Deciphering a runic inscription

With "inscription" defined as all runes appearing on an object, the next item of interest for the runologist is the actual text of an inscription. As Chapter 3 illustrates, said "text" is not the result of a simple transcription of what the runologist sees, but the result of a runologist's decisions in the process of deciphering an inscription, resulting in the aforementioned contradictory results. If the entity model is to mirror reality, it must therefore model this process. Yet there is, so far, no officially acknowledged way of "reading" a runic inscription. Each runologist has their own way of doing it and it is hard to describe the process in itself (Barnes 2013). Nevertheless, I have attempted to visualise what is going on in a flowchart (Figure 16) and drawn on Rundatabas' approach, which correctly models the different steps by using separate files to store the results. The first entity type is therefore defined as the result of what can be called "identifying the runes", followed by equating them with "ideal" forms, in practice, the character sequences encoded according to the character encoding in Chapter 3, here referred to as "transrunification" to avoid confusion. The entity type is called UNIRUNES (unicoded runes). While it may be argued that it would be best to include this kind of information in the object or inscription entity type, I disagree on four accounts.

1. Being able to store different interpretations is crucial for a runic research DB.
2. Owing to the demands of data integrity and to avoid data redundancy as well as practical reasons, it is not feasible to store them in column

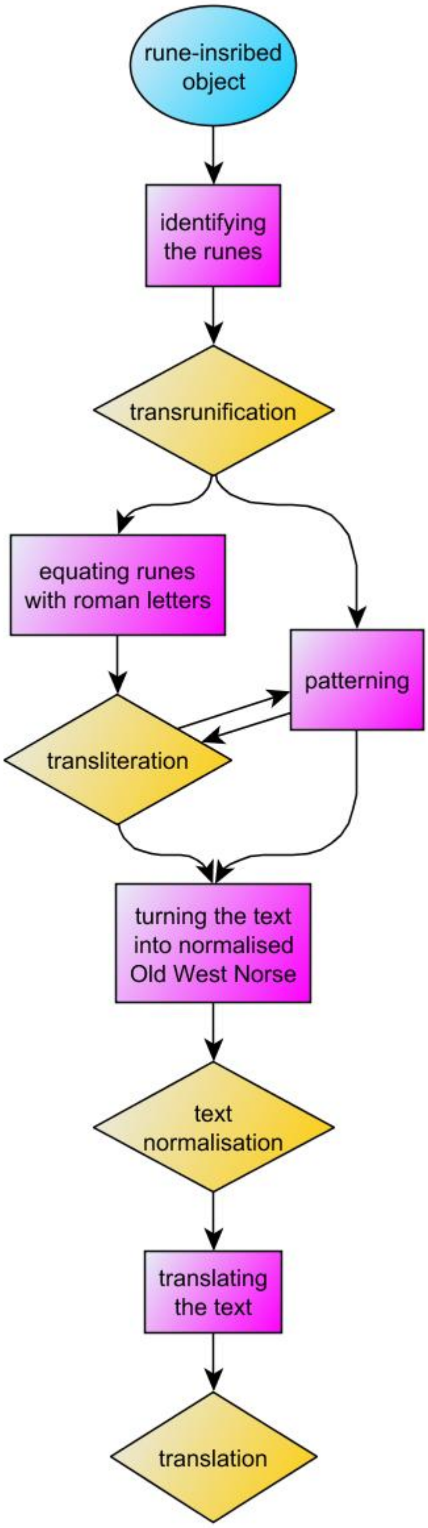


Figure 16. *Process of deciphering a runic inscription; yellow represents the outcome of a process, pink rectangles represent processes.*

after column in transrunification; it unnecessarily bloats the table and renders searches difficult and unreliable (Section 2.1). In a relational DB, it would also only be possible to do so by designating a certain number of columns to conflicting transrunifications (see Table 2), which brings one back to the issue of, at some point, having to make a decision on which transrunifications to keep and which to discard, or of designating an inordinate number of columns to account for potential new additions. This approach impacts negatively on data retrieval and is therefore to be avoided at all costs.

3. By using an RDBMS, entries are connected via their primary key (PK)/foreign keys (FKs), thus preserving the connection between inscription and transrunification, a clean structure and data integrity, while at the same time offering the possibility to store as many transrunifications as required; there is no limit to how many transrunifications can be connected to one inscription.

4. Considering each transrunification as its own entity and entering it as such instead of a column-based storage solution also solves another problem runologists sometimes struggle with, namely how to represent conflicting identifications of a single rune.

Provided each transrunification is its own entity, one does not have to resort to using slashes and enter, for example, ᚠ/ᛚ in order to save space and not have to add another column (like, for example, Runor still does; instead, these variations are encoded using XML in one single cell). Instead, two distinct records are entered, one ᚠ, the other ᛚ. Using the system introduced in Section 3.4.3, the uncertainty of the identification can easily be included as well by marking each entry with “b”:

1) ᚠboob
2) ᛚboob.

In combination, this encoding system and single-item-based entry permit a much more precise representation of the research product, the transrunification, than the current solutions working with backslashes, parentheses and square brackets ever could. That is not necessarily to say that they are easier to understand by a human; but they are *clear-cut* in terms of *data* – which is what matters in a DB.

In addition to considering each transrunification as its own entity, they were also broken up into smaller entities according to which side of the object they appear on. Again, this mirrors physical reality (the runes appear on different sides of the objects, Chapter 1).

Different transrunifications logically mean a variety of transliterations, since these are the result of a rune being turned into a Roman letter according to its suspected sound value (Section 3.4.5). Since the sound values can differ quite significantly depending on which rune row in question is used in the inscription, or in which order the runes occur, transrunifications can often be transliterated in many different ways. This indicates that there should be two entity types, because again, storing all possible transliterations for one transrunification would require an indeterminate number of columns. It is therefore more logical to treat them as two entity types.

The next step and entity type following transrunification and transliteration should, theoretically, be normalisation. Upon closer examination, though, I found that there is a process taking place beyond simply equating runes with Roman letters. I am calling this process "patterning", because what happens is that runologists are looking for familiar patterns in the text. Generally, these patterns are words – sequences of runes carrying semantic meaning, as do names, formulae but also nouns, verbs and so on. Based on what they believe they recognise, runologists "pattern" an inscription – establish it is written in OWN, contains two names and a formula and shows some non-lexical ("unpatternable") sequences (an example of what this looks like in practice is provided in Section 4.8.4). Runologists may base their transliteration on patterns they recognised in the transrunification, or they may only be able to recognise patterns after transliterating; this differs between runologists and from case to case. Thus patterning can take place right after the transrunification, or between transliteration and text normalisation. It represents its own entity type, as it is a process distinct from both transcribing and transliterating.

Once patterning has taken place and character sequences potentially representing meaningful linguistic utterances have been identified, most scholars will turn the text derived from the transliteration process into normalised OWN and/or Latin, a process called "normalisation", which is its own entity type as well. Translations into modern languages, although included in Rundatabas and KDB are, at present, not included in the entity model presented here for a variety of reasons, but can easily be added as yet another entity type.

To recap, the process of deciphering a runic inscription consists of the steps transrunification – transliteration – patterning – normalisation, with patterning taking place either between transrunification and transliteration, or after transliteration, or perhaps even at either stage. In contrast to other items listed by Düwel (2008: 16), this process takes place *every* time a runologist works with an inscription; in cases where they do not create a transrunification, transliteration or normalisation themselves, they use those created by previous scholars. These steps also need to take place before any other interpretation can be undertaken, like for example determining the purpose of the inscription or its cultural context. They are therefore the basis for everything else, and as such, need to be included in every relational runic DB. As this survey has shown, it is also advisable to treat them as separate entity types. Their ontological relationships can be expressed in words (following the example in Ramsay 2004):

> Runes on an object (entity type) are transcribed into a transrunification.
> Transliterations equate runes in transrunifications with Roman letters according to corresponding sound values.
> Patternings identify linguistic structures in transrunifications/transliterations.
> Normalisations apply certain orthographic rules to transliterations to render them more readable.

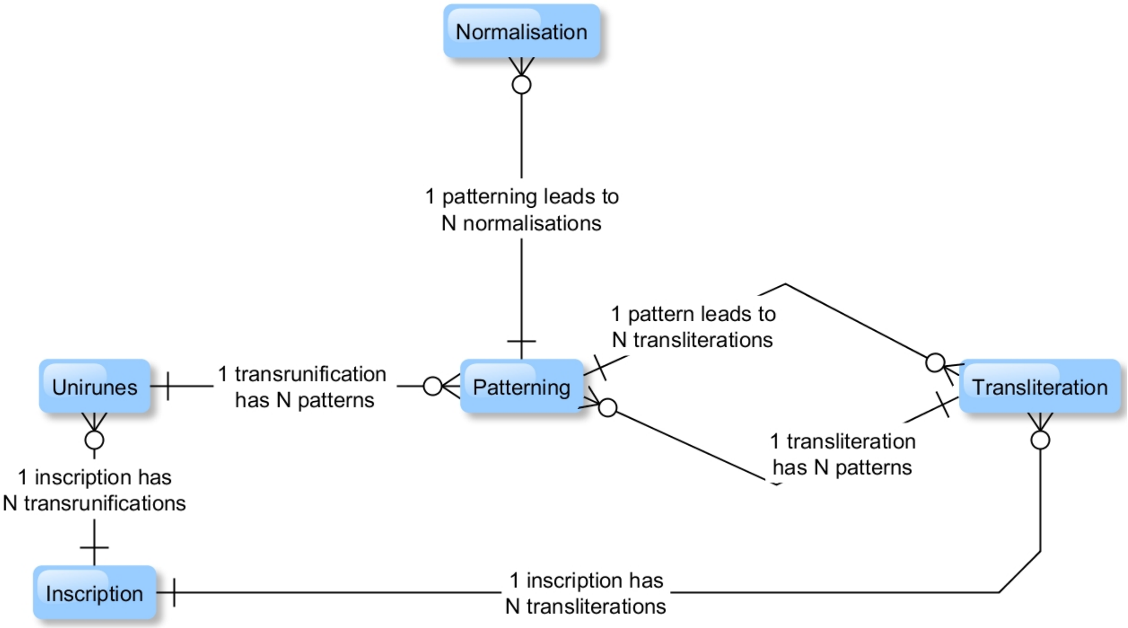


Figure 17. The core tables of a runological DB. In cases where no underlying transrunification could be identified, transliterations were connected directly to inscriptions. Ideally, every transliteration should link back to the underlying transrunification.

The entity model presented in Figure 17 expresses these ontological relationships between the different steps of the process.

When the process of deciphering an inscription is considered not as a single action, but as a process consisting of several steps (as, indeed, most transcribing of texts into digital text is, see Tanner et al. 2016), it becomes clear that transrunifications, transliterations, patterning and normalisations are actions distinguished by a) what data they are based upon, and b) what their output represents. This is also a good example for why it is frequently so difficult to translate research data into an entity model or use it in an RDBMS: to identify the entity types and their functional relationships, intense reflection on what one is actually *doing* is required.

4.6 From model to database

Developing an entity model for the research data is only the first step in the process of building a DB, however. With the conceptual outline, the next step is to "translate" the abstract steps into storage structures. This part of the process is often referred to as "data model mapping", in turn followed by physically designing the DB using the chosen RDBMS, after which the research data can finally be entered. At this stage, instead of talking about entity types, the physical structures are generally referred to as relations/tables. For the data model mapping process, an understanding of how the data is going to be stored is essential.

4.6.1 *Field types*

The term field type refers to the possibility of defining which format to store data in, for example text, number or date. While an RDBMS will still work without the DB containing anything but text fields, for storage and retrieval purposes, it is advisable to make use of other field types as well, as again, this helps prevent data corruption. The field type for each attribute should be carefully chosen to match the data. A selection of important field types is presented below, however it is by no means exhaustive and gives the respective names for field types for MS Access as well as other SQL-based RDBMS, since MS Access has its own terminology. Depending on which RDBMS is chosen, field types might also be inaccessible. SQLite for example, as the name suggests, is a stripped-down version of full-blown SQL DBMS and very restricted in terms of functionality, although it should be said that the operations required for a runic DB should be well within its limits. Consulting the documentation that comes with every properly developed RDBMS is the best course of action when deciding what system to use.

AUTONUMBER

The field type AUTONUMBER automatically adds a unique number to each entry. It is often used to assign PKs in MS Access. In MySQL, the field type would be INT with auto increment turned on. Using AUTONUMBER can be an easy way to quickly ensure unique PKs are given to new entries, but it can be preferable to assign PKs by hand.

NUMBER or INT

If a field is supposed to contain numeric values, it should be defined as a NUMBER or INTEGER field. It might not seem practical at first, however when PKs are made up of numbers, it can be useful to assign it as a field type to the PK- as well as FK-columns in other tables. It does not eliminate the possibility of entering a wrong value, but it at least limits typos to the ten number keys.

TEXT or VARCHAR

These fields contain text. This field type is very useful for bits of information like comments on an entry that do not fit in anywhere else. The actual number of characters can be set individually for each TEXT/ VARCHAR column, although a TEXT column can never exceed 255 characters.

MEMO or VARCHAR

The Bryggen material contains quite a few inscriptions consisting of more than 255 signs (although since they are broken up by object side, they generally do not exceed 255). MEMO and VARCHAR allow up to 65,536 alphanumerical characters to be entered, making this field type more suitable for the actual text of any runic inscription, including transrunifications.

BOOL or BOOLEAN

This field type is often interpreted as meaning yes or no. Actually, BOOL translates to "on (true)" or "off (false)". BOOLEAN fields are used as a simple method of indicating whether the statement at the top of the column is true or false for one entity, for example whether an object carries a runic inscription. BOOLEAN can also be used to reflect ambiguities in the material; for example, in OWN naming traditions it is not always clear whether a name is an idionym or a byname. Some names can be used for either gender, while with others, it is not clear whether or not they are genuinely Scandinavian or borrowed, in part or completely, from other languages (Section 5.1.2). As a rule, every time I chose BOOLEAN as field type, it was for the reason that something could be both or, in fact, contained both, as is the case with "language of inscription" in PATTERNING. Several inscriptions contain both Latin and OWN words, some others unintelligible parts which nevertheless are combined with legible and interpretable words and sentences. Ticking all available BOOLEAN fields ensures none of these inscriptions will be forgotten in analyses. It is perfectly possible to also return only results that say *Non-Lexical* and do not contain any proper text, or any of the combinations imaginable without having to sort them by hand.

While field types can be changed later on, it is in the best interest of the scholar to consider which field type might be most appropriate for storing which kinds of data. It helps the process of normalising data for input later on, but also forces the scholar to acquaint themselves intimately with their data.

Once entity types and attributes are established, the functional relationships between entity types need to be represented by connecting entities.

4.6.2 Relationships, primary and foreign keys

In the entity model, the connections between entity types are expressed by describing their functional relationship (works for, was written by, published by). In practice, relationships should only be established between tables that contain directly related information, such as for example an object and the context it was found in. It helps to imagine a hierarchy or network when thinking about how relationships naturally flow: an object *is found in* a grave *is located in* a cemetery *was examined during* an excavation *located in* a municipality *in* a country. This reflects the real world hierarchy; the relationship is established via the entity types and their relationships. There is a slight technological problem, however: A relational DB can *only* model one-to-many relationships (1:N-relationships). This means that one entity in one table may relate to zero, one or more entities in another table, but the entities in the second table *must not* relate back to more than one entity in the original table. These two tables then share a 1:N-relationship. When retrieving result sets, the RDBMS selects one inscription from one table, identified by its PK, and connects it to, for example, several transrunifications from another, equally identified by their respective PKs. This prevents confusion and data corruption.

Unfortunately, the real world more often than not consists of many-to-many relationships (N:M-relationships). For example, an inscription often contains more than one word and several words appear in more than one inscription. These words and the respective inscriptions are in an N:M-relationship. Linking these directly from one to the other table would result in multiple duplicate results when a query is run. Still, all occurrences of all words need to be connected to all inscriptions that contain them, but in such a way that when a query is run later, entries are not multiplied into the endless. In such cases, N:M-relationships are modelled using an intermediate relation to create two relationships: 1:M and N:1.

4.6.3 JOIN tables

The main function of JOIN tables (sometimes also called "junction") is to prevent this type of data duplication by breaking down N:M-relationships into one-to-one relationships (1:1-relationships). In practice, a JOIN is often made up of no more than one PK from each participatory table, for example the PK of the inscription and the PK of the specific word appearing in it. Thus words are linked to inscriptions and vice-versa. To further ensure data integrity, the combination of these two PKs can then be used as a compound PK in the JOIN; the combination can then only be entered once (if the word appears several times, that option should not be chosen). To understand this properly, the next section deals with PKs.

4.6.4 The vital role of primary and foreign keys

The question of how relationships are actually represented in a DB may have come to mind while reading the previous sections. They are created, quite simply, by using the unique identifiers from one table as reference points in another table. It was mentioned earlier that to retrieve information from a computer, for example to display a particular letter, unique identifiers are required (Section 3.3.1). RDBMS, too, require a unique identifier for every single entity/record stored within the DB. These are called primary key (PK) and are vital in data storage and retrieval. To put it very simply, PKs form *common, consistent* points of reference between the entity types in a DB. A PK is unique for each entry and only ever assigned once per table. If a record is deleted, any new records will not fill up the space thus created, but will continue along whichever format was chosen as PK.

Once the PK from one table is entered into a specific column reserved for this purpose in another table, it becomes a foreign key (FK). In other words, a FK is nothing but an attribute in one entity type, where the entity type uses a PK from another entity type to link the two records together. FKs, in contrast to PKs, can appear as many times as they need to; thus one object can be linked to several transrunifications, one transrunification to several transliterations and so on. The PK of one item and the FKs associated with it are what creates the relation-

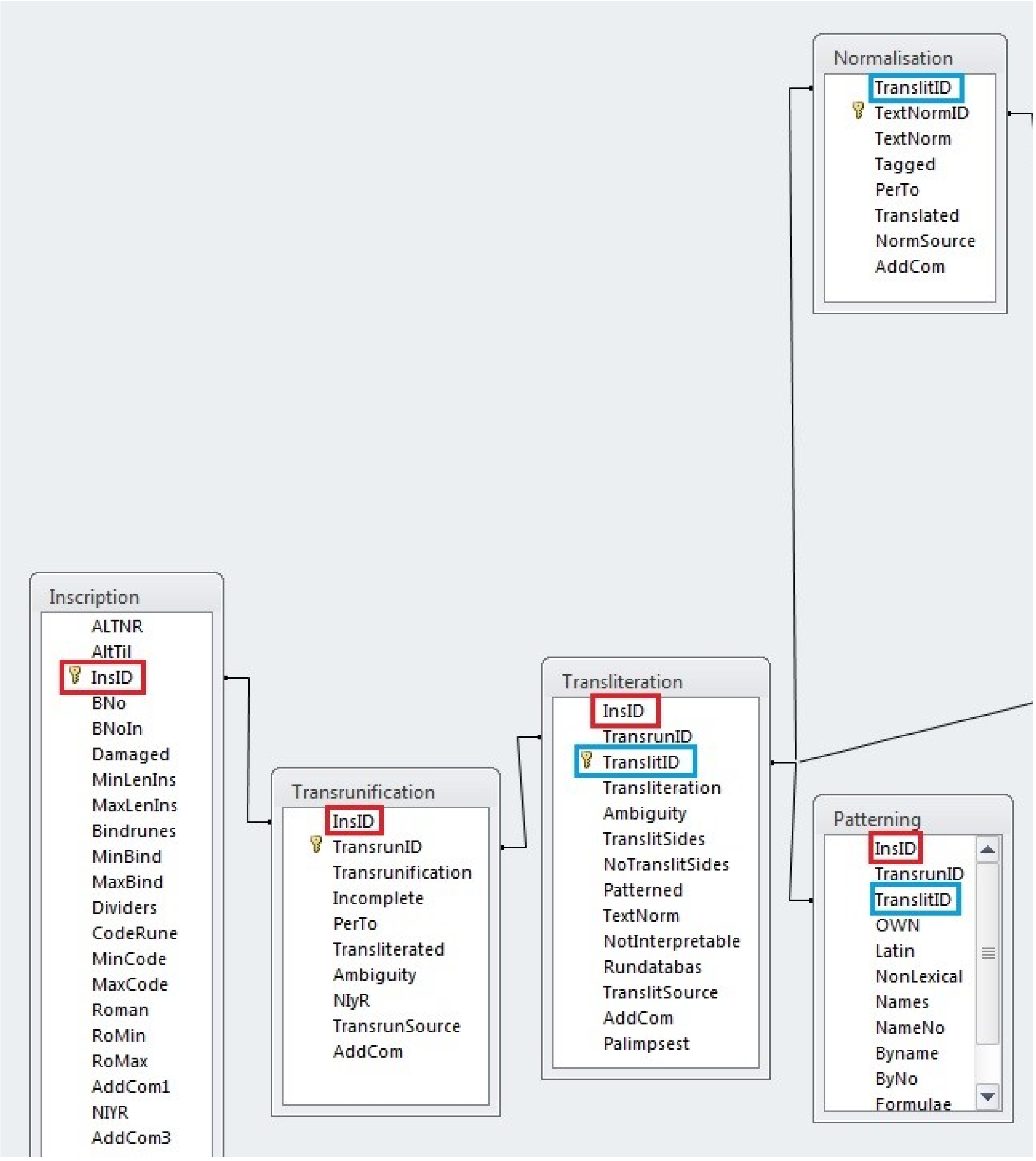


Figure 18. *Two PKs used in other tables as FKs. Microsoft Access 2010 marks the PK columns in the DB scheme with a little key, and the black lines symbolising the relationships connect the fields matched against each other when running a query.*

ship between the tables. Whenever data is retrieved from more than one table (i.e. an INNER JOIN is announced), users must state which PK and FK columns shall be matched against each other (Section 4.7.1). It is thus possible for the RDBMS to compare these columns and select only the records where keys match. (On a practical note, this makes it advisable to always use the same column name for the PK column and any columns in other tables referring to it. Simply naming the PK field "ID" is fairly confusing, not for the RDBMS, but for the user.)

Edition numbers, signa and other ways of identifying runic inscriptions in written editions are therefore not good choices as PKs. For one, all editions have different ways of using letters in combination with numbers, so there is no consistency. For the other, inscriptions on the same object may be given different signa in different editions (or even the same, see N693-694 in *NIYR VI*), and thus accidentally be added as two separate entries into the "objects inscribed with a runic inscription" table, which we must remember does not equal "single textual entities as perceived by runologist" – although a different definition of the entity type would make this valid; for the reasons why I defined this entity type and inscription differently, see Section 4.4. Adequate PKs may be letters or numbers or any combination thereof, but in order to retain data integrity, it is often advisable to use customised PKs for each separate entity type. Many RDBMS offer the option of automatically implementing the next incremental digit whenever a new record is added, though. There is disagreement within specialists in the field about whether PKs should ideally be *meaningful*, i.e. real data, like for example a student number (Elmasri & Navathe 2017: 507), or whether they should be unique, but randomised character sequences without meaning (Fuchs 2022). In any case, the uniqueness prevents users from accidentally connecting entity types not meant to be connected. Since this process of matching numbers is most easily explained and understood via example, the next section deals with retrieving information from the different tables of a DB.

4.7 Retrieving information: writing and running queries

The special power of RDBMS as opposed to other DBMS lies in the fact that the relational model allows connections between entities that are not hierarchically structured, but are instead created by the entities sharing the same attributes. With the ability to recombine, reassemble and connect different types of data into result sets containing exactly the data one is looking to analyse, they provide much more flexibility than other systems. In addition, they prevent data corruption from the outset by utilising queries to interact with the data. Result sets may then easily be exported into other applications, again without running the risk of corrupting the original data. RDBMS can therefore be described as tools to store and retrieve data *when it is needed*. Since computers can only understand precise, structured requests or commands composed using formal languages, requests need to be formulated in a specific way. In the case of RDBMS, the formal language adopted as a global standard is SQL (Section 2.1). While this "language" uses a simple syntax and a relatively short list of commands in order to enable users to control a DB, it is immensely powerful and the other reason why relational DBs are such useful tools (the first being the relational model itself). While there are more commands available, on the most basic level only the following three commands are needed to retrieve information from a multitable-DB: SELECT, FROM, JOIN.[1]

4.7.1 Example query: Finding Ólafr

To fully illustrate the potential of recombination, I built an example query looking for inscriptions containing any variation of the name *Ólafr*. As illustrated in Figure 19, the query starts out in IDIONYM (which is part of the research database described in Chapter 5). The purpose is to retrieve the inscription numbers of every inscription mentioning an Ólafr, e.g. to then track it through different geographic regions. To this end, the first order to the RDBMS must specify what type of query is to be run; in this case, it is a SELECT. The SELECT command forms the basis of all retrieval queries a user will want to run. Other possible first words are UPDATE, DELETE or CREATE. The RDBMS needs to know what data to select and where from:

[1] SQL-commands are often capitalised to avoid confusion with following columns or tables. The distinction is cosmetic. SQL is not case-sensitive, making spelling and syntax errors the only sources of problems. Ramsay (2004) or w3schools (2020) explain each command.

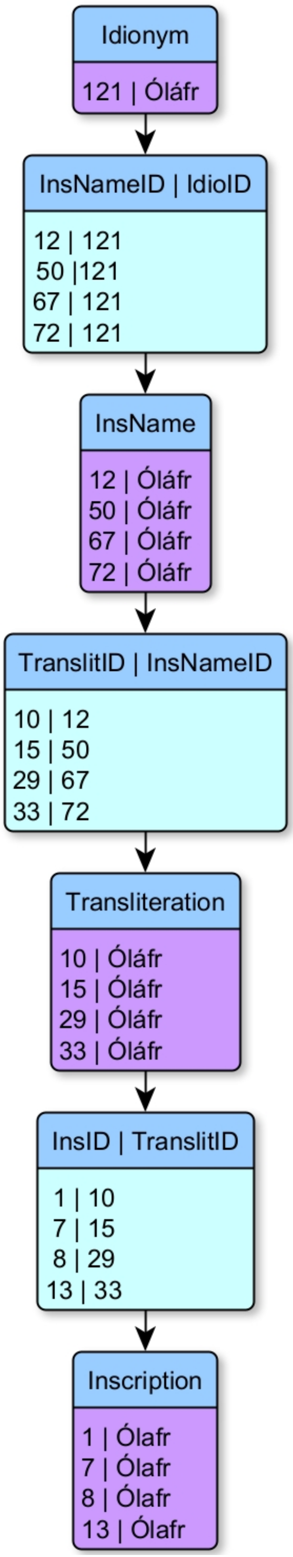


Figure 19. *The process of filtering all inscriptions containing Ólafr from the DB. Violet marks actually existing tables, light blue marks PKs stored as FKs in the next entity type.*

SELECT inscription.number

FROM

(((((inscription INNER JOIN transliteration ON inscription.primarykey = transliteration.foreignkey)

INNER JOIN patterning ON transliteration.primarykey = patterning.foreignkey)

INNER JOIN sequences ON patterning.primarykey = sequences.foreignkey)

INNER JOIN inscriptionnames ON sequences.foreignkey = inscriptionnames.primarykey)

INNER JOIN namejoin ON inscriptionnames.primarykey = namejoin.foreignkey)

INNER JOIN idionym ON namejoin.foreignkey = idionym.primarykey;

The code looks rather complicated; a proper explanation is provided in Section 5.5.5. For now, it is enough to know that results from more than one table are acquired via the function JOIN. An INNER JOIN will return all entries from the specified tables which contain data. There is no limit to how many tables may be joined together in this way, except the increasing complexity of the query and the potential to link up tables in the wrong direction. In the example presented here, seven tables are linked together; this also means that the column designations need to be further specified by adding the designation of the respective table they belong to. Table and column designation are generally separated by a full stop. It should be noted that the column designations change depending on where in the query they turn up, because the 1:N-relationships between the tables are mirrored. SEQUENCES for example is one of the above-mentioned JOIN tables and only contains FKs by default (creating a compound PK), while IDIONYM, TRANSLITERATION and INSCRIPTION all have proper PKs. The PKs from INSCRIPTION go again as FKs in TRANS-

LITERATION, the PKs of which are to be found as FKs in PATTERNING. Figure 19, where the PKs are symbolised by simple numbers, also illustrates why it might be wise to design bespoke PKs for each table to avoid corruption. With only the numbers serving as PKs, IDIONYM could be directly linked up to INSCRIPTION, yielding no useful results at all.

The query as it is now will return every inscription number connected to an idionym. Yet the result set is supposed to only contain results with Ólafr. To filter out the unwanted results, a WHERE-clause is added, by which one specifies what particular value of an attribute one is looking for. Since the attribute in question comes from IDIONYM, it provides the WHERE-clause:

```
WHERE idionym.name="Ólafr";
```

Words and expressions need to be put into double or single inverted commas, depending on the RDBMS used. In MS Access and MySQL, it tends to be double inverted comma, but this may vary between different versions. With (double) inverted comma, parentheses, square brackets and equation signs (amongst others) being operational characters, they should not appear as characters anywhere in the DB, as the RDBMS will not recognise them as such and be unable to query for them, unless specific formulations are used. Numbers are handled without inverted comma.

This query now returns only those inscription numbers connected to the idionym Ólafr. Since the names are not directly linked to inscription numbers (for reasons explained in Section 5.5), the query must follow the red thread of primary and foreign keys until it reaches INSCRIPTION. It can be written starting from either end, as long as the tables in between are lined up right, but in this case, it is written to start in INSCRIPTION.

Frequently, however, one is looking for a very precise piece of data. In such instances, query modifiers can be used to narrow down the search.

4.7.2 Query modifiers

Generally, query modifiers serve the purpose of narrowing down a particular result set even further. Mostly this is done to save time when looking only for a particular piece of information. WHERE-clauses by themselves are already query modifiers, but there are two more that play an important role in data retrieval here and which therefore need a short introduction.

4.7.3 Wildcards

There are cases where the precise value of an attribute is unknown. In such instances, wildcard characters play a vital role in permitting searches on the premise that not all information about the looked-for item is known (or, indeed, required, for example when only the Graphtypenklasse matters). These wildcard characters differ between different RDBMS applications; most SQL-based applications utilise "_" to symbolise a single unknown symbol, "%" to signify *none, one or several*. Wildcards are often used in one of two cases: 1) uncertainty about the spelling, 2) broadening query output. Consider for example the (likely) possibility that, in looking for everyone named *Ólafr* in runic inscriptions, the name has not been spelt exactly that way, instead *Olafr* or even *Olaf, Olav* (Chapter 3 explains why the glyph used to express a certain sound is likely to return wrong results). The doubtful characters can in such instances be substituted by "_", resulting in "_lafr". Running the query will now return every record containing any letter + *-lafr*. If the *Olaf/v*-spelling is a possibility as well, the sequence can be modified further into "_la_%", informing the RDBMS that one sign precedes -la-, one follows it and none, one or more further signs follow the unknown character.[2] The end result looks like this:

```
WHERE idionym.name LIKE "_la_%";
```

Translated into human language, the user is telling the computer to look for a sequence of four or more characters, the first, the fourth and any following of which are unknown, while the second and third must be -la-.

Obviously broadening a search in this way might produce results unlooked for, as the underscore can be replaced by literally any other character from the

[2] When using wildcards, the operator in the WHERE-clause needs to be changed from = to LIKE.

character map. It can, however, only be replaced by *one* character, therefore entries containing two, three or more characters followed by -la- will not be part of the result set. Neither will for example the name *Ola* be returned – it only contains three characters on the whole and the search specifies four characters at least. For runologists, wildcards are indispensable and incredibly powerful tools in view of the often unorthodox way rune-carvers put their words together.

4.7.4 DISTINCT

The other important query modifier is DISTINCT, used when, despite correctly established 1:N-relationships, some data might be duplicated in the result set. The frequency of names in inscriptions is one of the cases where this query modifier comes into its own right. As mentioned above, names may turn up in more than one, but also more than once within the same inscription (as is the case for the query illustrated in Figure 19). The use of DISTINCT now depends on the required result set. If the query is run as described above, all inscription numbers connected to Ólafr will be returned. Due to how RDBMS match records, this also means that if Ólafr turns up two or three times in the same inscription, this inscription number appears two or three times in the result set.

This might actually be what one is looking for (namely when the goal was to find out how often the name itself appears in the material). But when the aim is to create a map showing every place where Ólafr appears, this multiplication becomes an issue, since running a subsequent query for coordinates also multiplies the objects. If the map is then set to indicate number of objects, the map shows the wrong number of inscriptions. By adding DISTINCT to SELECT, this can be avoided, although it is important to remember that DISTINCT takes into account *all* the data in the result set. If another column containing different information is added (for example *transliteration*), the result will be distorted again.

Now that both sides, the technical and the runological, were given the necessary attention and it should be clear how the crucial first steps of deciphering an inscription should be modelled and how RDBMS store and retrieve data, the next section focuses on what these relations look like when brought into existence by using the RDBMS to create the required entity types as relations.

4.8 The core tables of a "model" runological database

The entity model for the core entity types/tables of a runic DB is presented in Figure 17, with the relationships between the entity types modelled according to the process of deciphering a runic inscription. Figure 17 also illustrates well that relationships are not restricted to existing only between two entity types; in fact, one entity type may even be required to relate to more than one other entity type. Again, the relationship is marked by a bespoke FK-column in the respective table. INSCRIPTION and PATTERNING relate to more than one other table, for a very simple reason:

Currently, the number of runic inscriptions found over the course of the Bryggen excavations (BRM 0 and subsequent) comes up to 677. The majority of these inscriptions has so far not been published; however, a small number of them has appeared in several academic publications, while others are at least referenced, although not adequately described. This leads to a situation where the process of reading an inscription was followed by the runologists, but single steps in that process have not sufficiently or, indeed, been published at all. I have striven to the best of my ability to find and include as many transrunifications, transliterations and normalisations as possible in the database, first and foremost from *NIYR VI* and *Rundatabas*, but also from literature on specific aspects like Markali (1983) and not least the original paper cards with Liestøl's notes. Nonetheless, in several cases it was impossible to determine which transrunification a transliteration was based on, for example for all entries concerning the Bryggen inscriptions from Rundatabas. Therefore a direct connection needed to be established to still tie transliterations to inscriptions, which ideally would not be necessary. However, in this case reality is such that the additional relationships are a necessary feature of the model. Why PATTERNING relates to different tables was already explained; NORMALISATION depends on it, since it is unlikely that a normalisation will be based on a transrunification and it is not directly based on the transliteration either.

This stage of the process marks the putting of theory into action, designing the concrete physical tables in the DB that one is going to fill with data. The table structure of each entity type is therefore the focus in the next few sections. While I was still working with MS Access 2010 at the start of this project, technical problems with searching for characters outside the ASCII-range necessitated a switch to MySQL. Therefore all technical terms used below refer to the DB vocabulary used within MySQL.

Another important question that needs to be decided upon *before* creating the physical tables is which character encoding to use in the whole DB, as tables using different character encodings cannot be connected by JOINs. Error messages will be returned until one of the tables is converted into the other respective character encoding, which in turn might result in the wrong characters being displayed in the end result (Section 3.3). The character encoding in this DB, named TAKERUN, is utf8mb4_general_ci.

4.8.1 Inscription

Creating tables in a DB, creating the DB from scratch, is done by either installing or making use of already existing installations of a DB-server application, like MySQL, MariaDB or others. Ramsay (2004) provides a good explanation (and so does, in fact, the documentation of these server applications), so I will concentrate on describing the practical considerations behind the choices of field types and attributes and only provide the relevant queries in Query C.1, C.2.

With the objects from the Bryggen excavations stored in a MS Access DB maintained locally at the University of Bergen museum (until 2017) and then the nationwide MUSIT-DB, each of which contain several hundred thousand records, it was more feasible to create the runological DB on a subset, namely all of the objects already identified as carrying runic inscriptions. INSCRIPTION therefore does not contain much information about the objects themselves, despite what was said above about using object as the basic point of reference, but rather provides the point of contact between the archaeological and runological sides of the DB. This also has the added benefit of adding one more layer to the DB and establishing a differentiation between "inscription" and "object", thus drawing attention to the fact that those two need not necessarily be synonymous (Section 4.4). The table is therefore also not named "object", tempting as that might be, but "inscription" – an abstract concept, in this case understood in the broader sense of all the text inscribed onto one physical entity. The structure is as follows:

Insid (inscription id) is the PK of this table, which technically would not have been needed if not for certain circumstances. Originally, the museum's inventory numbers were supposed to be used in this capacity (*altnr*, Table 51), since they are unique and would have directly linked to the archaeological DB. Unfortunately, one of the excavations yielding runic inscriptions, BRM 48, was never digitised and the inscription from this excavation therefore has no inventory number. It can be found in a list of the runic inscriptions at the museum and was therefore included. Some other inventory numbers were also entered incorrectly, causing confusion and duplicate entries. A bespoke PK for this table was therefore the logical choice.

Altnr (Altnummer) consists of excavation number/object inventory number/piece (the last referring to items which are broken and consist of several pieces; with the runic inscriptions, most of the time it will say 001), whereas *alttil* (Alt tilvekstnummer) is the object's inventory number without the excavation number attached. Since the objects originate from different excavations, this could not be used as a PK, as each excavation started counting again at 1, therefore creating duplicates. It is, however, useful when working in the archive, as the containers for objects in general do not carry the excavation number.

Bno (Bergensnummer) references the first runological number given to each inscription by runologist Aslak Liestøl. They were not viable PKs either for, due to Liestøl's untimely death, they do not continue beyond 672, while there are 677 inscriptions. *Bnoin* (Bergensnummer inscribed) refers to the sides of the inscriptions according to Liestøl and lists their letters (runologists often choose Roman letters to denote parts of inscriptions or

Column Name	Data Type	Length	PK?	Not Null?
insid	varchar	8	true	true
altnr	varchar	15	false	false
alttil	int	9	false	false
bno	int	6	false	false
bnoin	varchar	7	false	false
niyr	varchar	7	false	false
addcom1	varchar	300	false	false
addcom2	varchar	200	false	false
photographed	tinyint	1	false	false
rti	tinyint	1	false	false

Table 7. *Table structure* INSCRIPTION*. Length denotes the maximum number of characters that may be typed into a field within that column. NOT NULL indicates whether entering data in this column is mandatory or not. If it is set to "true", the column is mandatory and the RDBMS will not add a record unless a value is entered.*

different sides of an object).

Niyr notes the corresponding numbers from *NIYR VI* for inscriptions published there, while both *addcom* columns serve to note down any comments that might be important for scholars working with the inscriptions. It should, however, be noted that these comments relate to something in the table itself, meaning to the entity or one of its attributes. Comments on other aspects of the inscription should be noted either in the appropriate column in the right table, or in a separate table designed to house notes that would not fit anywhere else.

Photographed and *rti* were working columns added to keep track of which objects I had already taken pictures of during research visits to the museum, but they may of course be used to denote whether pictures and RTI-images of a particular inscription are available for other scholars as well.

The field types are either varchar or integer, and it should be noted that the length of each field is restricted (Data Type, Length). This is less to save space and more to ensure better control over what is being entered into each field, as it is easier to retain data integrity if the RDBMS helps by not letting one enter wrong values, or values longer than expected, into the respective fields. INSCRIPTION does not yet contain any data relating to the inscription itself, neither is it not meant to. Instead it concentrates on the essential information scholars might need to begin their research – inventory numbers, edition numbers and information about available images. It is only with the next few tables that the actual inscription becomes the focus.

4.8.2 Unirunes

As mentioned previously, most runic inscriptions were read and interpreted at least twice, which is in part why UNIRUNES is its own entity type. While the table could have been called "transrunification", the designation used is a shortened version of "unicoded runes", because that is really what the content consists of; and if another table containing transrunifications in the print style should be added, this will distinguish them.

Insid is the first FK column in the DB as a whole and contains the PKs from INSCRIPTION as FKs. This column is set to NOT NULL=true, as a missing entry in this column would create an "orphan record" (a record not tied to another entry), thus rendering it useless.

Urunid combines the table designation with "id", and holds the PKs for each unicoded transrunification, while the next column, *utransrunification,* contains the encoded information. With 700 characters, it is a very long field, which it needs to be since the five-character-encoding requires that

Column Name	Data Type	Length	PK?	Not Null?
insid	varchar	8	false	true
urunid	varchar	10	true	true
utransrunification	varchar	700	false	true
urunincomp	tinyint	1	false	false
urunobside	varchar	1	false	true
transliterated	tinyint	1	false	false
patterned	tinyint	1	false	false
uruncom	varchar	150	false	false
urunsource	varchar	30	false	true
urunsourcepg	varchar	8	false	false

Table 8. *Table structure* UNIRUNES. *See also caption to Table 7.*

much space in case of longer inscriptions. Since text is broken up into the individual sides of the object, the content of *utransrunification* is not as extensive as it could be if, for example, an inscription of 200 runes needed to be encoded (200x5=1000, not counting additional punctuation or indicators for bind-runes), but it still needs a fair amount of storage space.

The next column refers back to *utransrunification: urunincomp* is a BOOLEAN column indicating whether or not the transrunification in the preceding column shows the complete text of the inscription or only parts of it. This was deemed necessary because some scholars concentrate on particular aspects of an inscription and only publish transrunifications of these, e.g. Markali (1983), who only provides the names in transrunification, but generally ignores the remaining parts of the inscription. It is important to store this kind of information, because it could otherwise result in confusion and even doubts about whether two entries refer to the same inscription.

Urunobside gives the side letter, again because it would otherwise be easy to get confused when an object has more than one inscribed side with different texts. Unfortunately, the lettering of the sides depends on the runologist, so they may not be consistent throughout all publications of the inscription. The practice was nevertheless adapted for consistency, and a comment added in *uruncom* making a note of this complication.

Transliterated, patterned are again a BOOLEAN marked when the transrunification was transliterated/patterned, while *urunsource* and *urunsourcepg* hold, respectively, the PK of the literature reference and the page number in cases where page numbers can be given (obviously they cannot be provided when the information stems from another DB). Since the literature references are so important, this column is again set to NOT NULL=true.

4.8.3 Transliteration

Linking back to either UNIRUNES or, in cases where the underlying transrunification is not known, INSCRIPTION, is TRANSLITERATION. The PKs from either table are stored respectively in *insid* and *urunid* as FKs and the PK is labelled *tlitid.* It should be noted that to keep the PKs truly unique, the first few letters of each table which precede "id" are also used in the PK itself, so entries are designated "ins1", "urun15" or "tlit233".

Transliteration contains the actual text, while *tlitincom* serves the same purpose as in UNIRUNES, namely to indicate whether the transliteration is complete or parts are missing; equally *tlitobside* indicates the side. Because of the potential of numbering sides differently, this was deemed necessary, for nothing prevents a scholar working with someone else's transrunification to number the object sides anew according to their own interpretation.

Tlitcom, tlitsourcetlitsourcepg again contain additional comments relating to the transliteration (*not* the inscription itself) and literature references.

Column Name	Data Type	Length	PK?	Not Null?
insid	varchar	8	false	true
urunid	varchar	10	false	false
tlitid	varchar	9	true	true
transliteration	varchar	200	false	true
tlitincom	tinyint	1	false	true
tlitobside	varchar	1	false	true
tlitcom	varchar	150	false	false
tlitsource	varchar	30	false	false
tlitsourcepg	varchar	8	false	false

Table 9. *Table structure TRANSLITERATION. See also caption to Table 7.*

4.8.4 Patterning

As explained in Section 4.5, the process of deciphering an inscription starts with the scholar (trying to) observing patterns and then deciding on what they might mean. These observations concern characters, whether runic, Roman or unidentifiable, coded runes and a variation of others, amongst them the potential language of the inscription. Since there are many observations to be made on an inscription, PATTERNING is the most extensive in terms of columns within the runological part of the DB. However, while that is the case, most of the attributes are, in accordance with the requirements set out above, either number or BOOLEAN field types, permitting scholars to note down observations quickly. Since a patterning can be based on either a transrunification or a transliteration, both options are provided with *urunid* and *tlitid* as potential FKs. Unfortunately the general rule of making them mandatory cannot be applied in this case, for, as explained earlier, not every transliteration can be linked to a transrunification. Great care has to be taken with this table therefore to make sure the entries are properly linked up. Further observations concerning the inscription are noted down in the other fields. *Damaged* refers to whether the inscription (not the object!) has been damaged in some way, followed by information about the inscription:

OWN, latin, nonlexical refer to the identified language and are BOOLEAN fields. Non-lexical, in this case, means that the characters do not make semantic sense, *not* that they cannot be interpreted; this is different and marked in a different way (Section 6.2.2). While it would have been possible to use only one text field and use code to distinguish combinations of the three language options (even if non-lexical is not really a language), using three separate BOOLEAN fields enhances search flexibility and does not require users to remember the code, making PATTERNING more comfortable to use. Also, since the Bryggen inscriptions are by default normalised to OWN or Latin, no provisions were made for storing other potential languages, despite Rundatabas providing this kind of information. Should the need arise, though, it is easy enough to add another BOOLEAN attribute storing this information.

Owing to the research areas I decided to investigate with the help of TAKERUN, the columns *names, namesno, bynames, bynamesno* were created. Two are, once more, BOOLEAN and indicate whether one or more idionyms were identified in the transrunification/transliteration; the "no"-columns give the exact number so that it is possible to calculate how many idionyms in total appear in these inscriptions (see Chapter 5 on how to use MIN/MAX in queries to calculate totals).

PATTERNING was originally designed with a host of additional BOOLEAN-columns indicating, for example, whether particular inscriptions contained code- or bind-runes; it has since turned out that there are better approaches to storing this kind of information, therefore they were not used. As with the previous tables, it is also possible to add as many patternings for a single transrunification/translit-

Column Name	Data Type	Length	PK?	Not Null?
urunid	varchar	10	false	false
tlitid	varchar	9	false	false
patid	varchar	9	true	true
damaged	tinyint	1	false	true
own	tinyint	1	false	true
latin	tinyint	1	false	true
nonlexical	tinyint	1	false	true
names	tinyint	1	false	true
namesno	int	2	false	false
bynames	tinyint	1	false	true
bynamesno	int	2	false	false
patcom	varchar	150	false	false
patsource	varchar	30	false	false
patsourcepg	varchar	8	false	false

Table 10. *Table structure* PATTERNING*. See also caption to Table 7.*

Column Name	Data Type	Length	PK?	Not Null?
patid	varchar	9	false	true
normid	varchar	9	true	true
normalisation	varchar	300	false	true
normobside	varchar	1	false	true
normincomp	tinyint	1	false	true
normcom	varchar	150	false	false
normsource	varchar	30	false	false
normsourcepg	varchar	8	false	false

Table 11. *Table structure* NORMALISATION*. See also caption to Table 7.*

eration as required. The column settings are, however, meant to prevent entries like "runesno: 3-6" or "3/4", on the simple principle that these are two distinct possibilities for patterning one and the same inscription and therefore need to be entered as such.

Once more, it is important to remember that we are dealing with a system here that benefits greatly from clarity and that it does make a difference whether there are three, five or six names in an inscription, especially when statistical analyses come into play (Chapter 5). Having entered all of the patternings by hand myself, I can confidently attest that it is taxing having to enter six different possibilities for the same string of eight runes (and it also influences query formulation, Section 5.5.5). But once more, if this is what reality looks like, then this is what reality looks like and to represent it as closely as possible is the whole purpose of building a research database. In this case, for the benefit of precise data, conceding to the limitations of RDBMS and adding all six of these possibilities as distinct records is not a high price to pay, especially since most runologists will not add hundreds of entries at the same time.

4.8.5 Normalisation

NORMALISATION was included in the core DB as its own entity type. There is little to be said about its attributes that was not said already about the other tables. What is different to before though is that the normalisations are not linked back to TRANS-

LITERATION as may be expected, but to PATTERNING. When analysing the process of deciphering an inscription, I concluded that the text normalisation can logically only take place *after* runologists have patterned a transrunification or, more often, a transliteration. Without having identified certain patterns that can be orthographically normalised, it is not possible to normalise; therefore, the entity type has *patid* as a FK-reference.

Normalisation is only set to 300 characters, for, other than in *utransrunification*, no space is needed to store additional information like rune-type and uncertainty. Again, the field always contains only one side of the object, therefore 300 characters are plenty of space. *Normobside,* as before, marks the side of the object this normalised text is found on; *normincomp* marks whether the whole transliteration was normalised. This difference is important to note; in UNIRUNES, the equivalent BOOLEAN marks whether all of the characters on the object were transcribed into the coded system. In TRANSLITERATION, it equally marks whether there are some parts of the inscription that were not transliterated for whichever reason (since it is unfortunately impossible in several cases to establish whether the lacunae were already present in the transrunification, this field is not as informative as it could be). In NORMALISATION, though, *normincomp*'s purpose is to signify whether there were some parts of the transliteration that could not be normalised; these may well have been transcribed and transliterated, but they cannot be normalised.

Once more, *normsource, normsourcepg* contain literature references; and where these come from is the focus of the next section.

4.8.6 Literature references

As mentioned several times already, scholars cannot work without properly referencing the origin of their theoretical background, data and source materials, primary and secondary. With the process of deciphering an inscription, it is also quite obvious that the single steps of the process can be undertaken by different scholars, for example by one scholar publishing a transrunification and two others basing their transliterations upon this, and a further three normalising them in different ways. Representing this part of the process was one of the core aims of my project and by including literature references in each table representing the various steps, it is now possible to link the transrunification from one scholar to the transliterations from two others. Besides properly documenting who is basing their work upon whose prior work, this also enables other scholars to trace the process to its different sources, which, in my opinion, is a huge benefit. Including literature references in TAKERUN was therefore of the utmost importance, which raises the question of why there is no entity type LITERATURE. There are two reasons for this:

A properly designed literature DB following the relational model would once more introduce a host of new entity types into TAKERUN and the analysis chapters will show that there are already enough entity types that need to be added for the purposes of different research approaches. It therefore seemed unwise to combine TAKERUN, at the present stage, with a literature DB. More importantly, though, there are a number of perfectly well-designed and accessible literature referencing applications around. Designing a bespoke literature DB to include in TAKERUN was therefore a pointless endeavour, especially since a good proportion of them work on the same principle of assigning every entry its own unique key (or letting users define their own) and some of them, like for example JabRef, even permit direct connections to and import into relational DB. It was therefore chosen as the literature referencing application since it conveniently offers a function to work directly with a SQL-DB from the JabRef interface, meaning entries made via its interface can automatically be linked up to an SQL-DB without having to enter them into TAKERUN. As long as the bibtexkeys (PKs in bibtex-files) defined in JabRef correspond to the FKs used in the respective *-source*-columns, they can be linked up.

4.9 Conclusion

With the inclusion of the required literature references, the basic all-purpose-model for a relational runic DB is complete. These tables only mirror the very first steps in the process of interpreting a runic inscription, however. Düwel's list (Section 4.4) reveals that there is much more information relating to the domain "runic inscriptions"; after deciphering the runes, the process of setting the runic inscription into context begins. This may include, but is not limited to, looking for other inscriptions containing similar words/phrases/names, similar objects carrying runic inscriptions or working with the content of the text and interpreting it against the backdrop of what is known of people's lives during that time period.

As explained in Section 2.2, not all of these aspects can or should be stored within the same DB. But it is certainly possible to design further entity types concentrating on particular aspects of an inscription, like KDB did for syntactic structures. Within the scope of the original project, I largely concentrated on onomastic and qualitative text along with archaeological analyses; I am fully aware that other scholars might not be as interested in these aspects as I am. Therefore a distinction is made here between the entity types making up the *core* tables as opposed to the *research* tables. The core tables comprise the entity types deemed indispensable when working with runic inscriptions, whereas the research tables contain the aspects pertaining to my chosen areas of research. The next three chapters outline how onomastics can be used to analyse the social background of rune-carvers, how qualitative text analyses can help determine what purposes runes were used for by which groups of people and finally, how the use of runes changed over the course of time in Bjǫrgvin.

5 Onomastic analysis

Since human interaction relies heavily upon our ability to assign names to things, animals, places and people, with the name's ability to "stand in place" of the thing/person facilitating communication, onomastics, the study of names, are an important research area. Research focuses on different aspects such as etymology, transmission and usage of, for example, toponyms (place-names), but also anthroponyms/personal names (PNs)/idionyms (e.g. the wide range of studies presented in Hough & Izdebska 2016; Beech, Bourin & Chareille 2002; Burkhardt 1995; as well as the Scandiavia-focused onomastic research reviewed in Beck 2002). Onomasticians generally also agree that the onomastic material of a society or period is firmly rooted in the social environment in which it is used (for example Andersson 2003: 609; Stefani 2016: 54; Bramwell 2016: 265). Therefore, names are studied to gain insights into the culture and society behind the name (Bramwell 2016: 265), although for historical societies and communities, establishing whether the individuals behind the names shared a common cultural framework is difficult, in some cases probably impossible. While names derived from the same language are often used within communities sharing that language (or at least, a descendant of said language),[1] using names to ascertain ethnicity (and therefore establishing a group likely to share the same cultural framework) is inadvisable, for name loan can have taken place at any point in time (Andersson 2003: 608; also the spread of Biblical idionyms). Establishing the cultural framework of a single name-bearer is especially difficult if the name is the only known piece of information about a person, originates from a group in close geographical/linguistic contact with others or was borrowed into several languages. Instead, single names need to be interpreted (if possible) against the backdrop of the general name-stock of the whole community, since "much research in the field begins at the level of the individual name, but only reaches full significance when the results are grouped together, allowing patterns to emerge" (Hough 2016: 1). To this end, large corpora of names may be analysed in order to find out more about the society they were used in.

This chapter focuses on the large-scale analysis of names appearing in the Bryggen runic inscriptions to expose patterns on a macro-level rather than the analysis of single names on a micro-level. This decision is partly based on the fact that the names, just like the inscriptions themselves, present a coherent, datable corpus of names that can with great certainty be said to originate in an identifiable community. The study also serves to analyse the applicability and usability of RDBMS for large-scale studies of names appearing in runic inscriptions (see Janzén (1947b: 2) on the complexities of medieval onomastic studies or the more general comments by Bramwell (2016: 273)). Lastly, the decision is rooted in previous studies of parts of the name material, which mostly focused on the supposed internationality of the denizens of Bjǫrgvin (for example Johnsen 1981); yet they originate in cultures/languages geographically close to Norway, and should not, per se, be regarded as belonging to foreigners for that reason alone (Section 5.1.2). A large-scale comparative study of the general patterns might help shed some light on this and other questions regarding the background of the rune-carvers in Bjǫrgvin.

Due to the nature of the material, the analysis focuses on anthroponyms (the number of recognisable toponyms is too small to be of interest) with a view to what Stefani (2016: 54) calls their "social significance, that is, social identification and the embedding of an individual within a community". Yet identity, and how names express identity (Stefani 2016: 54; Bramwell 2016: 265, 270), are not the main focus; Geary (2002: vii) rightly cautions that names are not to be regarded as being synonymous with identity. Such studies are either conducted within the field of socio-onomastics and frequently include interviews (Aldrin 2016), or in conjunction with analyses of family trees (for example Le Jan 2002), neither of which are available for the runic material. Instead, the chapter first

[1] Some scholars would argue even this on very valid grounds, for example Parsons (2002: 35), who writes "[p]ersonal name fashions and general language are not the same thing, and people with Scandinavian names clearly do not have to speak Old Norse" about the use of OWN names in Anglo-Saxon toponyms.

provides an overview of current knowledge about OWN medieval naming customs and how names could be used as markers of kinship and social status, alongside the requisite definition of what constitutes a "personal name (PN)" within the scope of this study. The following section takes a critical look at sources of PNs from Scandinavia to contextualise the Bryggen names within the wider society and name-stock in Scandinavia. Section 5.3 and Section 5.3.3 focus on the methodological approach, while Section 5.5 presents the part of the entity model concerning this part of my study. Based on the results from the statistical tests in Section 5.3.3, the last sections discuss how they can help to contextualise the name material from Bryggen and possibly indicate socio-cultural implications of certain names.

5.1 "Mirrors of society": name-giving as a social practice

While the practice of using names appears to be universal to humans, the processes of choosing a suitable name, and what constitutes a suitable name, differ from culture to culture, which led Andersson (2003: 609) to describe names as the mirrors of the society in which they are created. The general practice in Scandinavia, likely already before Christianisation, certainly afterwards, was to name a child shortly after birth (Andersson 2003: 589). The identity expressed by the Bryggen names may therefore provide more clues to how the name-giver perceived the name-bearer's identity than to how the name-bearer themselves did; for them, their name was possibly "only one representation of identity" (Geary 2002: vii) Although renaming could take place (e.g. in the form of nicknaming), there is nothing to suggest this was a common occurrence, as it is in some other cultures, where names change according to the stage of life of a name-bearer (Bramwell 2016: 264). Most people likely carried their name throughout their lives, which made the process of choosing a suitable name all the more important. By doing so, the name-givers "placed" a child within the wider world, which in turn necessitates an understanding of how that world works. The strategies involved in naming may therefore be seen as "provid[ing] insights into otherwise impenetrable areas of medieval social values" (Geary 2002: vii). At a later stage, the original "placing" supplied by the given name might be expanded upon by the child/adult being given a nickname or byname that further anchors them in the community. Various factors contributed to the parents' (or another name-giver's) choice of name for the child, the most important being linguistic, religious and socio-cultural (Table 12). Each area comprises different factors that are taken into account when name-givers make a choice, although they may be unaware at the time, and the factors may manifest in different ways depending on cultures and languages, also in OWN naming customs. First, however, a short definition of "personal name".

Medieval Scandinavia did not know family names, a PN may therefore be defined as the single name designating an individual. Andersson (2003: 589) suggests "Individualname" (individual's name) and "Idionym", either of which would be suitable, whereas Leibring (2016) prefers "given name". Since the Bryggen finds date to after Christianisation in Scandinavia, a terminus like "Christian name" would also be appropriate, which should be avoided in pre-Christian times. I chose to make use of the term "idionym" when referring to the abstract concept, while using "name(s)" when referring to their use or specific instances, since most of the Bryggen idionyms were created in pre-Christian times. Using "Christian name" might falsely imply that the names are Christian in the sense of having been formally given in Christian baptism and based on Biblical names.

PNs are also distinct from hypocorisms (short or pet form of an idionym) bestowed upon individuals, potentially in order to better distinguish between individuals carrying the same idionym. They can replace the original name in daily use and gradually turn into their own independent form of an idionym. They are then in use as hypocorisms and idionyms proper at the same time, with little possibility to distinguish in the case of the single occurrence, unless the hypocorism is so unusual (or previously unknown) that it draws attention (Andersson 2003: 590). As far as the Bryggen material is concerned, I know of no case where the name was identified as a hypocorism, at least not in the sense that the actual name would have been the original version and the carved name a hypocorism. The possibility of some Bryggen names being hypocorisms instead of idionyms has to be accepted, since there is no way to pinpoint potential cases.

Alternately, additional names can be attached to an idionym as a "byname", based on OWN "kenningarnafn", which Whaley (1993: 124) also translates as "nickname". Andersson (2003) and Brylla (2016) appear to use a similar definition, but it is not quite clear whether Brylla considers the byname as an addition to the original name. Whaley (1993) uses the term exclusively for additions to an already existing name, for example "Þórir hjǫrtr" or "Skjaldar-Bjǫrn", and also for patro- and metronyms (names created by combining the father's/mother's name with the language's equivalent of "daughter/son"). Since either of these fulfil the function of individualising a person (Leibring 2016: 200), they might with some justification be included in the term "idionym", even if they are coined later in life as a reference to particular events, skills or characteristics of a person (Stemshaug 1982b: 25). Also, bynames can turn into proper idionyms in their own right (for example *Sturla, Snorri*).

There are only a handful of these instances in the Bryggen material, though, and again it is impossible to determine whether they were used as idionyms proper or bynames. The names referred to as "idionyms" within the scope of this publication therefore only comprise what Leibring (2016: 200) calls "given names": "the name (or those names) bestowed on an individual person, in most instances a very young child, with the purpose of individualising this child; to separate him or her as a person from other people in the vicinity. This purpose is combined with the aim of including the child in the family and in the (local) society."

Individualisation and inclusion strategies, however, have to take certain considerations into account, which can limit the choice and even directly contradict individualisation. One limitation is linguistic in nature: idionyms are generally formed of components of a community's language, unless borrowed from elsewhere (like the Bible). This can be utilised to signal or conceal the child's connection to a specific community (Section 5.1.2).

Meaning is another linguistic consideration, as an idionym may be composed of "common nouns which have preconceived associations, or anthroponyms with particular connotations of gender, social class, or religion" (Bramwell 2016: 273). In the case of ethymologically Scandinavian idionyms, the child's gender also directly influences its name – or rather, the linguistic structure of OWN predetermines which idionyms can be used for which gender. Germanic languages in general assign grammatical gender to nouns, and when making use of a noun in an idionym, the gender of child and noun had to correspond. Therefore female children could not be given a masculine idionym, and there is only a handful of exceptions where a noun classified as feminine can be used as a male idionyms. For the Bryggen material and the Scandinavian name-stock in general, there is therefore rarely doubt when classifying idionyms as *feminine* and *masculine* and identifying their bearers as female or male (Leibring 2016: 202; Andersson 2003: 596). The gender dimension also appears to have been more important than the semantic meaning of the components. Examples like *Hallsteinn,* composed of *hallr* (m), "(flat) stone" or maybe "stone slab", and *steinn* (m), "stone" (Janzén 1947b: 77), or *Hildiríðr,* with *hildr* (f) meaning "fight, battle" and *(f)ríðr* "beautiful (woman)" (Janzén 1947b: 78), certainly suggest that meaningful semantics may not have played a major role in these instances (Andersson 2003: 593). This also applies to the name material from Bjǫrgvin, where speakers of OWN would have known and recognised the single elements.

Religious connotations did, however, play a role. A rise in idionyms including Norse deities' names (Shaw 2011) preceded the influx of Christianity-inspired idionyms, which also appears to have triggered a change: prior to Christianisation, deistic idionyms were never given to children by themselves, only as part of a dithematic idionym (Andersson 2003: 608; see also Section 5.1.1 for variations on *Þór-* and *-þórr*). Dithematic idionyms are names like the two examples above, made up of one noun and either another noun or an adjective. Conversely, monothematic idionyms only contain one noun, e.g. *Bjǫrn.* Generally the second element's grammatical gender decides the idionym's gender; for monothematic idionyms, there is no question.

Area	Factors
Linguistic	meaning of the name origin of parents gender of the child
Religious	names of sacred persons/gods taboo names
Socio-cultural	social background of parents family traditions (emotional) associations considerations for the child's future location of the child at birth

Table 12. *Influences on naming; table based on, among others, Nyström (2016) and Leibring (2016).*

The names of pre-Christian Scandinavian deities are never used as monothematic idionyms and only as the first element in dithematic idionyms, which has led to them being regarded as taboo names by scholars. They appear to have lost this status after Christianisation, although they still were not bestowed often, now likely owing to the heathen connection (Janzén 1947a: 130; Stemshaug 1982b: 36).

Conversely, Saints' names of different etymological origin and their derivatives were soon used following Christianisation, up to the point where they appear with equal or greater frequency than etymologically Scandinavian idionyms, with the notable exception of *María*. This lists a surprisingly small number of occurrences; with the exception of a few princesses, the name itself is not found as a PN in either Norway or Iceland before 1500 (Lind 1905-1915: 764). It appears that while the pre-Christian deistic idionyms lost their taboo status, certain Biblical idionyms took their place (Johannessen 2002: 36, with references to other scholars). This is important to keep in mind, as *María* occurs no less than 19 times in the Bryggen material (Section 5.5.1).

Restrictions on name choice, whether linguistic, gender- or religion-related, narrow down the pool of possible idionyms considerably. Other potential influences are of a more emotional character and impossible to trace or guess at (Table 12); emotional association (i.e. positive/negative connotations) and wishes or expectations may be reflected in the name, e.g. choosing a deity's name as a first theme in hopes of securing the child special protection (Nyström 2016: 50; Leibring 2016: 211-212). More visible are different strategies signalling a child's connection to a certain family, in-group and society (see Leibring 2016: 211-212 for a more extensive list).

5.1.1 Expressions of kinship

Lacking last/family names as a means of identifying a person as part of a specific family, people in Germanic-speaking areas made use of alliteration, name transfer and variation to different extents to associate children with particular families and lineages. Perhaps variation was the predominant way of naming children before the Viking Age and was later replaced by name transfer, partly due to changes in the language that rendered people unable to apply the principle any longer (Stemshaug 1982b: 27; Andersson 2003: 606), although the corpus of pre-Viking Age idionyms is not great or varied enough to be making any definite statements. Variation is made possible in Germanic languages in general because idionyms are often dithematic (page 77), meaning they consist of two nouns, or one noun and an adjective joined together. Parents could thus easily take one part of their own names and create a new name for their child out of them, directly associating the child with its lineage. Examples can be found in the Icelandic family sagas, e.g. in *Egils saga*, where *Úlfr* has two sons, one of them named *Þórólfr*, incorporating the father's name *Úlfr* as a deuterotheme

-ólfr in the son's (the first being *Þór-*). His name is later transferred to a new child; one of his brother Skalla-Grímr's sons is named *Þórólfr*. The second Þórólfr's brother re-uses *Þór-* when naming his son *Þórsteinn* (more examples in e.g. Stemshaug 1982b; Janzén 1947a; Andersson 2003). Úlfr's first son is therefore directly associated with his father, whereas the other sons and grandsons are associated with other family members, uncles or cousins, which may have served as a mechanism to strengthen familial bonds.

A toned-down version of variation is alliteration. The first sound or letter of the child's name corresponds with the first sound/letter of the father's/-mother's name. In the example above, both principles are in use when *Þór-* is used in *Þórólfr* and *Þórsteinn*. According to Andersson (2003: 606), it is not surprising that they are often used in conjunction, it is more a question of who made use of them. He as well as Janzén (1947a: 34) and Stemshaug (1982b: 30) consider these strategies typical for families of high social standing.

The *Egils saga* example also shows instances of name transfer (also referred to as *(fullnamns)oppkalling, uppkallelse* or *Nachbenennung*). The custom itself dates back as far as the Migration Period according to currently known sources (Andersson 2003: 606). It describes the practice of naming a child after dead ancestors, most often grandparents or partners (Halvorsen 1984: 117). It is distinguished from variation by the name being transferred whole to the child (Stemshaug 1982b: 29): *Þórólfr* > *Þórólfr* instead of *Þórólfr* > *Þórsteinn*.

At the time of the Bjǫrgvin rune-carvers, variation appears to have disappeared, although it is impossible to pinpoint when exactly the change was completed (Halvorsen 1975: 161). With name transfer taking over, idionyms start to "go again" in families (Halvorsen 1984: 117), perhaps indicating an even stronger marking of family ties than alliteration or variation (for example Andersson 2003: 606; Halvorsen 1984: 118). The switch from variation to name transfer results in already common idionyms becoming even more common. Rare idionyms, on the other hand, have a higher chance of declining in use or even disappearing completely, a phenomenon commonly referred to as "name-stock reduction". This is the opposite of what variation entails – the recombination of nouns permits new idionyms to be created at any time. Although the full extent of the reduction cannot be gauged, several scholars noted that name transfer leads to a reduced name-stock in general in the areas where it is practised (for example Chareille 2002: 18; Bourin 2002: 4). However, this observation was made on a comparatively small basis, and raises the question of how much evidence we may be missing. Chareille (2002: 21) observes that in large corpora (i.e. beyond single family trees), "names borne by a single individual make up a large part of the corpus of names (often more than half), even though the concentration of choice on certain names was greater during this period."

Since these larger corpora frequently consist of lists from (tax) registers, whereas the phenomena of variation, alliteration and name transfer can only be observed in family trees, this begs the question of precisely whose name-stock was being condensed once name transfer became predominant. Preserved family trees tend to favour families of high social standing, while tax registers should, in theory, mirror at least most of the tax-paying population. It is possible that neither of the three principles was actually used among the non-attested population for a long time. Stemshaug (1982b: 29) already provides another example of an Icelandic family where neither principle appears in the family tree, perhaps due to the difference in social status between the two families in question. Halvorsen (1984: 117) suggests that at least within the upper echelons of society, name transfer may have been utilised as a way to show the child's or even the parents' legitimacy in claiming to be part of the kin-group. Having established their social position by means of their name, children could then rightfully avail themselves of the power exercised by said kin-group. He refers to the custom as "legitimeringsoppkalling", apparently a widely adopted approach amongst families of high social status (Le Jan 2002).

While data from Scandinavia is lacking for the time period under consideration (1100-1400), based on evidence from other countries, there is a possibility that different naming strategies may have been in operation within the different groups of society. Potential social implications of an idionym play a big role in PN-studies and naming strategies employed by certain Germanic/medieval Scandinavian families have been taken to indicate that the social status of a child or its parents may have strongly influenced the choice of name. It remains to be seen whether this hypothesis can be supported and if so, in which ways naming strategies differ between social groups. Gathering the required data is difficult however, since large name corpora (tax registers etc.) do not necessarily contain information on people's descent. Nevertheless, the possibility cannot be discounted and should be kept in mind especially where the Bryggen material is concerned, as there is no reason to assume that rune-carving was necessarily restricted to the privileged, like the Roman alphabet.

5.1.2 Markers of foreign descent

With Bjǫrgvin being the most important Norwegian trading hub and the king's seat (Helle 1982: especially 153-172), one can safely assume that several different social as well as ethnic groups met and interacted with each other there. Potentially, they also made use of runes as a means of communication. The Bryggen names were early on used to illustrate Bjǫrgvin's international connections, evoked mainly by a passage in *Sverris saga* referencing the multi-nationality of the traders even at a very early stage of the town's development (Hauksson 2007: 159). The first such study was presented and subsequently published by Johnsen (1981), illustrating connections to other geographic regions on the basis of foreign idionyms. Hagland (1988a,b, 1989) presented an hypothesis about the name-tags from Bjǫrgvin actually being part of the Icelandic rune corpus rather than the Norwegian. Seim (1989, 1991) rejected this hypothesis on grounds of Hagland's methodology, which she deemed insufficient for the task. Instead she concludes that Hagland's examples mainly signify inter-Scandinavian trading relationships, with little evidence to support more precise geographic placement than "Scandinavia and related areas". That does of course not rule out that some of the name-tags may have been carved by Icelanders or Greenlanders, however if that is the case, there is no telling which. On the whole, Hagland's endeavours inadvertently support Andersson (2003: 608) in that PNs should not be used to ascertain ethnicity, especially when there is intense contact between different peoples. A number of studies on name material from medieval Norway such as Gunnes (1983) and Meldgaard (1994) also uncover differences in naming customs from different regions and times and the fact that OWN was spoken in Iceland and Norway with only minor variations only complicates matters further.

Potentially foreign idionyms in the material should nevertheless be paid attention, although there is the difficulty of what precisely constitutes a "foreign" idionym. In the process of name loan, idionyms are often adapted to the new language's pronunciation, spelling and grammatical system; it is then difficult to argue that they are still "foreign". From an etymological point of view, their origin is "foreign" in the sense that their components are not part of the language they are used in; however, they can still be carried by someone who is definitely part of the local community, and this also applies even when the idionym is not adapted into the new language.

Yet the presence of foreigners within a given population is an important aspect; they not only represent a distinct group within a given population in terms of their origin, but often also in terms of their social (and legal) status. They may even strive to remain distinguishable from the local population for several generations, with idionyms playing an important part in establishing their identity. Laliena (2002) analyses two different communities using foreign idionyms in medieval Spain, the European *francos* and the Muslim population originating from the Arabic conquests. The *francos* continued to use idionyms from their areas of origin for several generations, thus setting themselves apart from the local population carrying, for the most part, Basque idionyms (Laliena 2002: 125). In this case, geographic location at the time of birth influenced the choice insofar as an etymologically foreign idionym was consciously chosen by the name-givers to emphasise their (ancestors') origin (Table 12). Written sources as well as archaeological evidence suggest that the presence of children of mixed (linguistic and ethnic) background can be assumed on a frequent basis in a well-connected town like Bjǫrgvin, especially at later stages. Whether they are visible as such is a different question altogether; the origin of the parent(s) only has visible consequences when the name chosen is etymologically distinct; even then it can be a form adapted to the local language. Therefore the presence of an etymologically foreign idionym by itself gives no indication whether the bearer was of mixed background, a foreigner visiting/living in Bjǫrgvin or the result of an import from another language. A notable example for all three possible explanations being the case is the wife of Haraldr harðráði, daughter of Yaroslav, Princess of Novgorod by birth, given the Hebrew name *Elisabeth*, but spelled *Ellisif* in manuscript sources, the pronunciation having been adapted to OWN. She is of mixed background, too, granddaughter to the Swedish king by her mother, given an imported Christian name and then following her husband to Norway. Yet unless a person's background is known to the same extent from other written sources, there is little possibility of deciding whether an instance of a Christianity-inspired idionym is a foreigner or a Norwegian with a Christianity-inspired name. Additionally, the common hypothesis is that Christianity-inspired idionyms were first utilised by the upper social scales in order to broadcast their affiliation with the new faith (Schmidt 2002), suggesting that Norwegians with these idionyms are more likely to be of higher social status. It does not logically follow that foreigners carrying these idionyms would automatically have held a high social position in Norway, however.

Moreover, preferences for specific idionyms also vary between countryside and towns. Halvorsen (1984) concluded that the names of townspeople, in contrast to those of people from surrounding areas and the hinterlands, appear to be strongly subjected to foreign influences. This is almost certainly due to the towns' heightened exposure to foreigners; as a result, their idionyms became part of the general name-stock in different ways: traders brought them, priests were imported following Christianisation, men entered the king's service, men and women married to strengthen alliances between countries, towns or political allies (cf. page 81), and immigration in general (Halvorsen 1984: 7). The idionyms probably filtered from the towns to the hinterlands, if they did get there at all, and the origin and number of foreigners in Norway changed over time. Halvorsen (1984: 121) mentions especially the German influence, becoming more visible during the 13th century due to the rise of the Hanseatic League, while the English influence must have been stronger during the 11th century.

Foreign idionyms are, however, not the only influence on a town's name-stock; towns also attract many people from the countryside, who bring their naming customs. That in turn means that one can expect different naming customs to co-exist, mix, overlap, interact and form something new. Bjǫrgvin as an important trading centre (and one of few towns in Norway at the time) is sure to have had its share of foreign immigrants as well as local workers flooding in from a certain point in time, although the exact point in time is still a matter of contention between historians and archaeologists. The expectation is that the runic material reflects this mix of men, women, foreign and local, of high and low social status, as expressed by Johnsen (1981); the question is how and in which ways it does.

Following this, the presence of etymologically not-Scandinavian idionyms does therefore not necessarily indicate the physical presence of foreigners in Bjǫrgvin. The etymological origin of an idionym does not have to correspond to the background of the name-bearer, although that *can* be the case; but certainly where idionyms borrowed into several different languages are concerned (e.g. *Johannes,* appearing in Bjǫrgvin as *Jóhan, Jóan* and *Jón,* with the original name not being present other than as the saint, see Section 5.5.1), there is no telling. At times, it is even impossible to tell the etymological origin: *Samuel* and/or *Samson*, shortened to *Sam* and fashioned with the *-r* mandatory for masculine names in the nominative case is impossible to distinguish from the etymologically OWN *Sámr*.

Another problem is presented by the inscriptions being for the most part of a less formal nature, for name use in official documents and in informal sources can differ quite significantly.

5.1.3 Name use in daily life

For the current survey, this represents an issue because the two corpora of idionyms chosen for comparison consist of mostly official diplomas (letters, deeds, wills, see Sections 5.2.1 and 5.3). Due to their nature as less official documents, the idionyms people used in the Bryggen inscriptions may not have corresponded to those people would have used in more formal documents: "official names are those which are recorded and endorsed by the state or other authorities, while unofficial names are usually maintained within oral tradition" (Bramwell 2016: 273).

The reason for using a different name can be harmless, for example a hypocorism in an intimate message (page 76), or it could be motivated by politics; considering the content of INS424 (hyperlinks to transliteration and normalisation in Runor are provided in Table 73), some rune-carvers may have wished to remain anonymous. Yet the difference between official and unofficial name does not only refer to the existence of two different systems of writing existing side-by-side in Bjǫrgvin (manuscript and runic writing). Especially with foreigners present, this dichotomy may have taken several different forms. "Official" and "unofficial" suggest that name-users/name-bearers differentiate between the names they are referred to in everyday situations. For a person speaking one language at all times, the difference consists most likely of using a nickname in daily life, and the "proper" given name in official documentation (Janzén 1947b: 57). Where foreigners are involved, it may also refer to literally two different names existing side-by-side, one used by the host, the other by the native community. The *franco* population consciously chose to emphasise their origin by using idionyms with a different etymological origin than the local language (Laliena 2002); the Muslim communities co-existing with the *francos* and the local population, chose differently: they continued to name their children in their inherited tradition, using different names for interaction with the Christians they were surrounded by. They were not entirely dissimilar to their proper given names, but had been modified by Christian officials and Laliena (2002: 130) concludes that "[b]y accepting these designations, the Muslims protected their true names; [...]. These names veiled the names of the Muslims and helped them to maintain their social identity." These two naming systems only emerge by comparison with contemporary Muslim written sources. The approach differs fundamentally from the *franco* approach, who apparently did not feel a need to disguise their identity like this.

Translated to the situation in Bjǫrgvin, a local pronunciation and spelling of an etymologically foreign idionym does not necessarily mean either that the name-bearer is a local, nor that they are not a local; the use of an etymologically Scandinavian idionym could still conceal a foreigner. But unlike in Spain, no religious conflicts complicated matters between the different groups in Bjǫrgvin. Tensions are reported for later periods, mainly during the times of the Hanseatic League's residence, and King Sverrir reprimands specifically the German merchants for bringing wine and trouble to Bjǫrgvin (Hauksson 2007: 159). Yet these seem never to have reached the point where the adoption of a different naming system or the concealment of the original idionym was deemed necessary. Additionally, German, Dutch and English idionyms, all derived from Germanic languages, were much more similar to Scandinavian idionyms, which cannot be said about the Muslim naming system (Laliena 2002: 126), and therefore not as glaringly obvious to begin with.

Still, that does not rule out children of mixed background using one name within their family and another in public or foreigners adapting their names for whatever reason. An etymologically Scandinavian idionym appearing in runes may well belong to a foreigner or a child of mixed background, who chose to use it in the context of a runic inscription; or the foreign idionym may have been spelled as the Scandinavian equivalent by a rune-carver aware of the parallel. Some inscriptions containing foreign idionyms are even ascribed to Norwegian carvers (Johnsen 1987: 730). It is impossible to pinpoint where this may have happened and since the runic inscriptions in a lot of cases seem to have been carved with some everyday purpose in mind, it is possible that there are more foreigners in the runic inscriptions than we are able to recognise by idionym alone. With only these at our disposal and as problematic as it is to assume that etymology of idionym and background of name-bearer correspond, this study must by necessity take the approach that etymologically non-Scandinavian idionyms, especially when not spelled in an OWN fashion, are treated as indicators that the name-bearer could have been a foreigner, although that may only refer to one parent. Whether in particular the Christianity-inspired idionyms indicate people of a higher social status is discussed in Section 5.7.2. Etymologically Scandinavian idionyms, conversely, are considered as indicating Scandinavian name-bearers; this also includes, by the same issue of etymology, potentially Irish, Orcadian or English name-bearers. Section 5.7 is dedicated to establishing whether there are certain idionyms within this group that appear to be used preferentially by families of high social status.

5.2 Names as indicators of social status: prerequisites

Since our knowledge of the medieval society in Bjǫrgvin is by no means comprehensive, analysing idionyms to gain information about specific individuals is only feasible to a certain extent, if at all, and in particular questions concerning whether a name is the idionym or a hypocorism, or an individual with an etymologically non-Scandinavian idionym is actually not Scandinavian, will often have to remain unanswered. Conversely, analysing broader patterns to gain knowledge about how idionyms were distributed amongst the population in general and how the Bryggen material compares to that, is possible, provided a comparative corpus can be found.

Just as the Bryggen material was used to (futilely) establish nationality to trace trade connections, the idea that idionyms can be used as indicators of social status has long been accepted in onomastics. First brought up by Lévi-Strauss, other scholars have picked up on it; Stemshaug (1982a: 36) for example puts forth the hypothesis that names only consisting of one theme might have been used more often amongst people of lower social status within Germanic-speaking areas. Schmidt (2002: 96) disagrees; too little is known about social distinctions with regard to naming customs in medieval Scandinavia. Geary (2002: vii) puts it as follows:

> A truism of medieval scholarship is that observing ordinary medieval people making choices and giving meaning to important aspects of their lives is almost impossible for the modern historian. Written sources, produced largely by a clerical elite and concerned primarily with the affairs of the great, leave the vast majority of the population of Europe known to us at best only by their names, recorded in lists of witnesses to legal proceedings, in tax rolls, or in liturgical texts.

The Scandinavian countries are no different; the question is which society exactly is mirrored in the naming sources and customs known to us (Section 5.1.1). It is difficult to say with certainty how widespread the custom of name transfer was, yet the surviving family trees of Scandinavian families of social standing suggest that certain idionyms were used repeatedly in specific families. Since families as well as persons hold a social status within any given community, the name of a person could thus also indicate their social standing – to a certain degree. There is little known about how protective families would have been of "their" idionyms or even if this was a common phenomenon across the social scale, since the sources for which it is attested tend to be prejudiced towards the upper social scale. Even so, "social status" is rather a vague construct, not to mention that determining the social status of a long-dead person is notoriously difficult, especially if the person in question was not part of a family well-known through written sources. Stemshaug (1982b: 25) insists that the choice of idionym was restricted by the requirement that it had to indicate which kin-group the child belonged to. Would that have applied to people whose kin-group was not particularly powerful or important? As far as Germanic and OWN idionyms are concerned, there is a regrettable lack of sources enabling scholars to test these hypotheses.

When analysing the Bryggen material against the backdrop of naming customs in Norway at that point in time, the sources at our disposal are restricted, particularly because the corpora need to contain at least a few hundred names; the larger the sample size, the less the picture will be skewed by single deviations from the general pattern.

5.2.1 Name sources in Scandinavia c. 1100-1400

In order to establish a corpus of names to compare the name corpus from the runic inscriptions to, the choice fell on using the name material from the diplomataria published in *Diplomatarium Islandicum* (*DI*) and *Diplomatarium Norvegicum* (*DN*); more precisely, the basis for analyses is the lexicon compiled by Erik Henrik Lind, *Norsk-isländska dopnamn ock fingerade namn från medeltiden* (*NID*). Despite all its inherent problems and inconsistencies, it still forms the basis of most studies on OWN PNs, since studies of Scandinavian onomastic material tend to focus on toponyms. Research into medieval Scandinavian PNs is scattered and most often concentrates on one or a group of names, analysed in regard to their elements and etymology. The comprehensive and still relevant study of OWN PNs, Janzén (1947a), focuses on etymology and semantics.

Sources used by other scholars to determine name patterns include urbaria (registers of property ownership) alongside parish registers and account books, as well as the Regesta Norvegica, a collection of all known documents mentioning Norway and/or Norwegians (e.g. Johannessen 2002; Gunnes 1983). These, however, overlap with the material compiled in *DI* and *DN*, while the urbaria date to later centuries and are therefore not suited for direct comparison. In terms of similarity, the onomastic material from Bjǫrgvin could also be compared to the name corpora found in runic inscriptions in Sweden and other Scandinavian countries. Yet these often date to the Viking Age, earlier than the Bryggen inscriptions, the oldest of which can be dated to the 12th century. Furthermore, since my study makes use of statistical hypothesis testing, there are certain requirements regarding the nature of the corpora:

- The comparative data had to come from sources which can be fairly securely attributed to a specific social background.
- It had to originate from approximately the same time and place as the Bryggen corpus and preferably include a large number of names (this is relevant to the χ^2-test, Section 5.3.4).
- If possible, it also needed to be quantifiable in order to compute percentages, and – maybe most importantly – the sources had to be genuine and reliable.

“Genuine” in this instance means that the sources had to be Scandinavian and best written in OWN and/or Latin, the two languages predominant in the runic material. “Reliable” concerns the actual existence of the persons mentioned, which cannot always be guaranteed where literary sources are concerned. *DN* and *DI* answer all of the requirements – technically.

NID collects more than the name occurrences from *DI* and *DN*, it also includes saga material and *Landnámabók*. Íslendingasǫgur and Konungasǫgur were excluded from the present study on account of discussions concerning their historical reliability with regard to protagonists, especially minor actors (see for example Halvorsen 1984: 114). Equally excluded was *Landnámabók;* though generally a reliable source for names due to being more of a historical account than a work of fiction, it is fraught with other problems: the naming customs reflected are for the most part Norwegian, entangled with the naming customs from the whole area of Viking influence around the Atlantic and Irish Sea region, and it is important for the current study to be reasonably certain where the namebearers hailed from. Besides, the idionyms found in *Landnámabók* are those of the settlers; most of them date earlier than the Bryggen inscriptions (ca. 870 to the 11th century) and also represent a mix of different naming customs in themselves owing to the origin of the Icelandic settlers (Simek & Pálsson 2007: 241).

DI and *DN* contain, for the most part, contracts, private correspondence and ware orders. They therefore most likely represent a corpus fairly similar to the Bryggen inscriptions (Chapter 6), and just like these, they come in handy, quantifiable manuscripts (see Section 5.3, specifically Section 5.3.2 for the methodological approach taken). They also fit the requirements in terms of time scale, as the documents date to between 1050 and 1590 (*DN*) and 834 to 1589 (*DI*). The latter was included be-

Gender	Total of m/f/-/mf idionyms in sample	*DN* total of m/f/-/mf idionyms	*DI* total of m/f/-/mf idionyms	Bergen total of m/f/-/mf idionyms
m	192	31,338	5,268	415
f	40	3,734	710	77
-	9	2	0	9
mf	1	0	0	2
total	242	35,074	5,978	503

Table 13. *The total tokens of masculine, feminine, unidentifiable and gender-neutral idionyms in the samples from DN, DI and Bergen, based on the sample of 242 idionyms appearing in the Bryggen corpus.*

cause potential Icelandic traits in the Bryggen material have been debated quite fiercely and foreign influence, whether Icelandic or elsewhere, is an important factor (Hagland 1988a,b, 1989; Seim 1989, 1991). The aim was to establish whether there are notable discrepancies in the name patterns discernible in either corpus. That it is possible to use statistical methods to show that there are different distribution patterns for certain idionyms, is certainly an interesting outcome, especially considering that the languages spoken in either country are mutually intelligible dialects of OWN.

5.2.2 NID: a critical evaluation

Despite being best suited to the purpose at hand, by nature of the content type as well as other factors, the diplomataria, and consequently the lexicon *NID* based on them, are not wholly without problems when used as a comparative corpus. Like every historical source, the diplomas were subject to various destructive influences over time and many are without a doubt lost. Considering the expense of manuscript writing, it is also almost certain that in poorer areas of either country, manuscript writing never took place on a large scale. Like other new techniques, it took time to become properly established and later centuries therefore tend to produce more material on the whole, which helped more diplomas from those periods survive. Later centuries are therefore by default better represented.

The most important argument against using the diplomataria for surveys of Scandinavian idionyms and naming customs are the people responsible, however. The diplomas were written almost certainly by or for the ruling class, or at least persons of a high social status: "The material is little representative both geographically and socially; the upper social circles, small in numbers, are strongly overrepresented, and it is 'noble' men from the West Coast, Trøndelag and northern Norway who dominate, especially before 1177" (Halvorsen 1984: 116, my translation).

In regard to a comparison with the Bryggen material, however, this bias towards the upper social echelons is an advantage. Since the social status of diploma authors can be determined with reasonable certainty, while that of the rune-carvers cannot, notable differences between those two corpora may hint at the potential social status of rune-carvers in Bjǫrgvin.

The dominance of masculine idionyms in the diplomataria, however, does not present an advantage. Gender bias is common for all written sources of the medieval period for various reasons, amongst them acquiring the necessary skills and women's legal rights. This is not to say that women are absent in the diplomas; it means that feminine idionyms will by default appear with lower frequency than masculine idionyms. This, however, also appears to be the case for the inscriptions as illustrated in Section 5.2.2: out of 242 attested idionyms, 40 are feminine as opposed to 192 masculine idionyms, disregarding 9 where the gender association could not be determined and one which can be used for either gender. There is a clear bias towards masculine idionyms, but really telling is how often those 40 feminine idionyms appear in the diplomataria. The 242 sample idionyms add up to 35,074 single occurrences in *DN*, in *DI* to

5,978 (Table 13). Out of these, feminine idionyms appear only 3,734 in *DN* and 710 times in *DI*.

Since the sample is restricted to the 242 idionyms attested in the inscriptions, there is no point in calculating how often feminine idionyms appear in diplomas; this should be calculated once the single occurrences of *all* feminine idionyms in the diplomataria have been counted. Within the current sample (see also Sections 5.3.2 and 5.6), the feminine idionyms make up *DN*=10.65%, *DI*=11.88% and Bergen=15.31%. While the runic inscriptions therefore show the highest proportion of feminine idionyms, there is still no equal distribution between masculine and feminine. Although these numbers are subject to knowledge and further research about both inscriptions and diplomas, the three corpora are alike in this respect and may therefore be compared to each other.

One particularly complicating factor, which potentially also skews the numbers presented, is the actual number of documents printed in the diplomataria, or rather the ones available at the time Lind compiled *NID* and *Norsk-isländska namn ock fingerade namn från medeltiden. Supplementband* (*NID-S*), which he mentions himself (Lind 1905-1915: IV). Idionyms published especially in the later years were not added to the lexicon. *DI* was only published up to vol. XII in 1932, with *NID-S* appearing one year earlier. Since *DI* was, to my knowledge, published quarterly, it is uncertain how many volumes Lind was actually able to use for his supplement. Vol. XII was published between 1923 and 1932, so it is theoretically possible, but by no means certain that he used all single volumes except for the last for the supplement. Everything published *after* 1931 is definitely not included in either *NID* or *NID-S*, distorting the numbers in addition to transmission and historical selection processes.

Another issue relates to the same kind of problem Lind already faced. He warns readers that "[t]o identify as one or tell apart persons belonging to a time when family names and last names weren't used at all, will always be a very difficult task, which never happens without mistakes and errors" (Lind 1931: III). He also mentions that especially patronymics (which I included in my counting exercises) might have been overlooked, not least due to missing indexes (Lind 1905-1915: IV). Since this point is very important for my methodology, I shall return to it in Section 5.3.1.

A problem specific to Lind's methodology was criticised by Halvorsen (1984: 116):

> [...] he does not register all names according to the same principles; he does not include foreigners, or mentions that most bearers of one name are likely foreigners without mentioning for how many this may be the case, or considering how the foreigners might be distinguished. Danish or Swedish immigrants to the Norwegian towns with common Scandinavian names will stay under his radar while English and German immigrants will be registered as foreigners because of their names. [...] there is the possibility that immigrants with non-Scandinavian names have children in Norway and thus further the use of foreign names (my translation).

Section 5.1.2 and Section 5.1.3 address these issues in more detail. There is no helping the situation, however, even if it is obvious that when using the names from Lind (1905-1915, 1931), they should be properly evaluated, which in turn would have required looking at each single diploma. There was neither time for this nor was it the aim of my study. Thus the diplomas are considered as documents written in one country by a specific social class, including part of what is nowadays Sweden since the east of Norway also comprised Jämtland and Bohuslän. No attention is paid to whether the person mentioned is a foreigner (although Lind every now and then mentions their origin), because without consulting the diploma itself, ignoring the occurrences marked as foreigners is arbitrary.

5.3 Quantifying names: methodological framework

If conclusions regarding the social status of an idionym are the goal, it is crucial to first establish whether social status can be expressed via idionyms in the society under investigation, and secondly, which idionyms can then be said to carry which implications. Regarding the first point, some doubt must remain attached to any answer. The practice of name transfer appears to have been widespread in Scandinavia according to the sources available, yet it cannot be said for certain which families would follow the custom and whether observing it was of more importance amongst families with a high social standing, as Stemshaug (1982b: 29) suggests. Additionally, for lack of evidence, naming customs amongst those not or rarely mentioned in those same accounts cannot be determined. Also, with generally a wealth of relatives, different idionyms could be chosen, so a certain selection would still take place (Meldgaard 1994: 212). Since evidence so far indicates that name transfer was common amongst those likely to end up in historical accounts as well as sagas, this study works on the assumption that this observation is correct.

Choosing the diplomataria as a comparative corpus is therefore justified by the fact that individuals likely to be mentioned in historical accounts and sagas tend to be members of the community holding a certain social status, which is in many cases connected to wealth. Both *Íslendingasǫgur* and *Konungasǫgur*, for example, make a point of mentioning the protagonists' monetary means, often in connection with them being able to equip or reward their followers with precious items. Consequently, they belong to the group involved in the kinds of transactions (e.g. land sales, donations to churches Johnsen 1987: 717) necessitating diplomas. That does not preclude people from lower social scales being mentioned, nor does it mean that those mentioned in the diploma also wrote it, nor that they frequently did so; they may also be mentioned in the diplomas for a variety of reasons. Them being mentioned in a diploma still connects them to a certain group of actors. *DN* and *DI* therefore likely reflect, at least to a certain extent, the naming customs of wealthy Norwegian and Icelandic families.

In practice, it is impossible to ascertain how wealthy a person or family would have had to be to necessitate manuscript writing and what social status that person would have held within the wider community. As outlined in Section 5.2.2, the diplomataria are strongly biased with regard to timescale and geographic region. Still, they mirror a particular selection of society which, due to the nature of documents and geographic origin, is particularly well-suited for comparison with the Bryggen corpus. It is important to understand though that when referring to the upper social scales in this study, this not necessarily refers to people of royal birth or the aristocracy (although they are part of that group), but rather those parts of the population who could, and did, frequently employ diplomas as a means of communication, either for personal or official purposes. Whether they would have been considered as part of the upper social scales by their contemporaries is immaterial.

The answer to the second question, which idionyms can then be said to carry which implications, needs to be determined by making use of a corpus which can with some certainty be ascribed to the upper social scales of the society in question; in this case, the diplomataria. Ascribing a high social status to every idionym appearing in the diplomataria simply because of its presence is premature, however, as not every idionym appears with the same relative frequency. To figure out which were particularly popular amongst those appearing in these corpora, the occurrences of each must be counted and the numbers then compared to each other to create a ranking reflecting frequency of usage (Chareille 2002: 24).

5.3.1 Name occurrence and name-bearer

Name occurrence as opposed to individuals carrying said idionym is often easily answered with regard to saga protagonists. It is much more difficult to determine whether two diplomas containing the same idionym refer to one or two individuals. Since the diplomataria also contain private correspondence, it is, in fact, quite likely that the same person would be referred to in several different diplomas. This presents a difficulty in terms of name ranking. One very prolific diploma-writer might raise the counts for a single idionym significantly, thus skewing the ranking. In order to distinguish idionyms popular among the upper social scales, it is the number of children it was given to, not how often said children would have used it in writing, that counts.

Parsons (2002) and Gunnes (1983) were faced with a similar problem when counting, respectively, the names in Domesday Book and Regesta Norvegica V. Parsons applied statistical methods to the Domesday PNs to produce "an informative sample of the anthroponymic habits of the landed classes in the mid-eleventh century" (Parsons 2002: 35), while Gunnes (1983: 152) was analysing the influence of foreign/borrowed idionyms on the overall Norwegian name-stock. Both made it quite clear though that the idionyms they were looking at mirrored wealthy, land-owning individuals/families. Their corpora are thus very similar to the diplomataria and my initial methodology builds upon their work (Section 5.3.3). They also faced the same problem of determining whether they were counting name occurrences or individuals:

> It is, for instance, impossible to deduce that Old Norse *Grímr* was bestowed upon children in the fifteen counties where it is found in the Domesday record, because two or three 'Grims' could hold land in numerous counties and distort the figures. This is a clear limitation of the Domesday evidence: too many Domesday people are unidentified for the number of distinct individuals bearing a common name to be established (Parsons 2002: 37).

Gunnes (1983: 167) also addresses the problem: "[...] I followed the rule that where only a person's given name is noted, every occurrence of said name was counted as different individuals. On the other hand, people with identical given names and patronymics I have regarded as one and the same, where the index did not explicitly distinguish them" (my translation).

The distinction is important. At the same time, establishing name-bearer identity with such certainty that individuals are not counted several times by accident is difficult, likely impossible, and in many cases probably not even wise, unless said name-bearers are easily recognisable (the king, certain nobles) (Parsons 2002: 37-38; Gunnes 1983: 167-168). Given the sheer size of the diplomataria corpora, establishing identity of name-bearers for this study and then counting occurrences of said name-bearers in the material would have required examining some 26,000 diplomas. This was far beyond the scope of my project.

Other factors also need to be taken into account. To begin with, and as discussed above, the individuals mentioned in the diplomas cannot be considered a representative sample of the whole population of either country anyway. Since diploma writing was not something everyone engaged in, certainly not to the same degree, it can also be assumed that while some individuals entertained extensive correspondence, others would not. Individuals appearing dozens of times in the diplomataria also do not necessarily present an issue. The purpose of this experiment is explicitly to determine the potential social status of name-bearers. An individual with the resources to maintain extensive correspondence is supposedly also wealthy in some way; and a wealthy individual is more likely to also have a high social status. Counting name occurrences instead of individuals is therefore a reasonable approach, since the more often individuals appear, the higher their social status likely was, which in turn could have reflected back on the idionyms they carried. In other words, conclusions about the social prestige of an idionym are not only dependent on how many people carried it, but how often those that did had the means (or necessity) to engage in manuscript writing.

In the runic inscriptions as well, two tokens may refer to the same individual. INS91, for example, probably carries *Finnr* on two sides, yet it seems likely that this is only one individual. This possibility also exists for every other inscription carrying the same idionym. Different dating of the object is an argument for them referring to different individuals, but different handwriting (or -carving, as the case may be) is already not, as the inscription could have been carved by someone else. Ironically, the two instances of *Finnr* on INS91 are likely carved by different hands (Liestøl & Johnsen 1980-1990: 165) and even different datings may not be an argument considering that an object may have been redeposited, which applies to many of the rune-inscribed objects from Bergen.

As a last means to determine individuals, in diplomas and runic inscriptions, spelling might be employed. *NID* though illustrates the vast possibilities of spelling one and the same idionym in a time without standardised orthography (cf. also footnote 6 in Parsons 2002: 30). Again, the opposite also holds true: the same spelling might still refer to two different individuals, who by coincidence use the same combination of characters. Spelling, therefore, is also no basis on which to establish an individual. In some cases, different spellings also raise the question of whether the name was correctly identified/standardised by Lind (see also Section 5.5.3 about the difference in standardisation between scholars working with the material). Again, returning to the diplomas and weighing the options was beyond my possibilities. Evaluation will therefore have to wait for further studies and working with occurrences rather than individuals is the most practical way forward at present.

5.3.2 Counting diplomataria names

Following Parsons (2002) and Gunnes (1983), I therefore counted name occurrences rather than individuals, on the explicit understanding that some individuals will thus find their way into the sample several times, but working on the assumption that these cases will be the exception rather than the rule. To retain the distinction between "individual" and "name occurrence", as well as the distinction between idionym and "instance of idionym", the two former are considered as the "type", whereas the latter are "tokens". Whenever referring to raw numbers quoted as "tokens", one individual may be counted several times, with the number of "types"/individuals unknown. Similarly, when referring to tokens of idionyms, the tokens are single instances of the idionym in question.

Unfortunately the diplomataria are not yet digitised in such a form as to allow specific searches for names.[2] Therefore I counted the tokens for each idionym in Lind (1905-1915, 1931) by hand, distinguishing between the Norwegian and Icelandic diplomas to identify idionyms with high usage in these two corpora. I did not distinguish between foreigners or idionyms appearing in patronymics; it was a simple question of how often one idionym is registered in the diplomataria. The results were then entered into IDIONYM (Section 5.5.3). While the database structure described in Section 5.5 was explicitly built around the idea that the RDBMS should count tokens for me, I did a manual count as well to be certain of the number of tokens in the inscriptions and retained the possibility of counting inscriptions (another kind of "type") rather than token. Table 77 provides both counts and illustrates that on several occasions, the same idionym appears twice or even thrice in the same inscription (*Arni*, *Sigurðr*).

Time did not allow for the counting of *all* idionyms in Lind (1905-1915, 1931), either. I was only able to do so for the 242 idionyms attested in the Bryggen inscriptions; the analysis is therefore prejudiced insofar as it only indicates which of the idionyms appearing in inscriptions show high and low relative frequencies within the diplomataria. This approach does not allow for an overall picture of which idionyms are generally more often used by the upper social scales, which should be kept in mind at all times. Time restrictions also prevented establishing an internal chronology of naming customs based on the dating of the diplomas; nor was it possible to trace regional differences within either country based on the place of issue, which would have contributed to a more fine-grained analysis. Thus a serious problem remains in the form of the diplomas dating between 834 and 1550 in the case of *DI*, and 1050-1590 in *DN*, outdating the time-frame of the Bryggen inscriptions (ca. 1120-1413) on either side by about 150 years. Since manuscript writing activity and preservation conditions varied from the beginning to the end of these periods and also between the two countries, the numbers are going to reflect these circumstances, thereby skewing the analysis. The bias of varying preservation cannot be alleviated, but it is to a certain extent possible to alleviate the dominance of Norwegian diplomas by choosing the right statistical tool.

The core problem is illustrated by a comparison of the number of manuscripts in each corpus: *DN* contains between 18,500 and 20,000 manuscripts (for unknown reasons different numbers are given on the English and Norwegian versions of the website that permits searching *DN*) in 22 volumes, whereas *DI* only contains 8,858 in 16 volumes. It would thus be astonishing, to say the least, if the number of idionyms and the tokens for each totalled at the same for both corpora. Summation

[2] *DN* is available and searchable online, however test runs did not return correct results.

of tokens of the 242 distinct idionyms appearing in the inscriptions as PNs reveals that they total at *DI*=5,978 and *DN*=35,074 – the second sample is almost six times the size of the first, a clear sign that direct comparison of raw numbers is inadvisable.

Statistical methods have in the past been applied successfully to medieval name corpora (Parsons 2002: 29-30), so it is mainly a choice of tool and clarifying the limitations of each approach chosen. Percentages are generally used to help *describe* observations rather than establish whether the observed differences are statistically significant, meaning that the observed differences are not the result of a badly chosen sample or coincidental deviations within even a well-chosen sample. When attempting to establish statistically significant differences in distribution of a particular item like an idionym within different samples, it is in most cases inadvisable to rely on raw numbers as a basis for comparison, albeit this has been done (Hagland 1988a, 1989; for criticism of his approach see Seim 1989, 1991). Parsons (2002) and Gunnes (1983) compare rankings or percentages rather than counts of tokens, but Parsons only uses them to describe distribution within one and the same corpus. Gunnes (1983: 152-153, 162, 164) uses percentages, but provides the sample sizes of his two corpora and clarifies that this approach carries risks (Gunnes 1983: 168).

Several factors can lead to percentages indicating differences where in fact, there are none, starting with the fact that the approach assumes that the statistical population is a given, independently verifiable total rather than "what managed to survive" or, as is the case here, a total based on educated guesses of the actual number of diplomas at a scholar's disposal. "Statistical population", despite making use of the term "population", generally refers to the total of any given item or event relating to a research question or experiment. Since *DI* was not fully published at the time Lind (1905-1915, 1931) were compiled (Section 5.2.2), I had to rely on date of publication to estimate how many volumes of it Lind might have consulted. This study therefore works with *DN*=20,000 and *DI*=6,640 as the total of documents. The latter number is based on the sum of diploma numbering from vol. I to XI of *DI*, published in 1925, which – lacking information on how many issues Lind used – is the last one I deemed possible for him to have utilised given that *NID-S* was published in 1932. Additionally, the population size regarding total number of tokens contained within the manuscript corpus, is also skewed by me only being able to count the total tokens of the 242 idionyms from the Bryggen inscriptions.

5.3.3 Name patterns in Iceland and Norway

Thus far, I have assumed that the division into Icelandic and Norwegian diplomas as well as considering each as providing a name corpus by itself are a given, although Lind (1905-1915, 1931) combines both. Since the editions of the diplomas are two separate works and the two geographic regions in question are also separated by an ocean, looking at each corpus by itself appears logical. However, Iceland was settled to a great degree by Norwegian immigrants and failing to take this into account could potentially lead to drawing wrong conclusions. The possible differences in naming customs in Norway and Iceland which several scholars, not least Lind, have commented upon, are so far unproven hypotheses by and large based on qualitative observations.

To solve this issue, at least to an extent, this study takes a quantitative approach to the matter. The number of idionyms and the possibility to count their tokens in *DI* and *DN* render it possible to test for significance, i.e. test whether naming patterns within the samples truly are distinct. The tool chosen for hypothesis testing is Pearson's χ^2-test (pronounced *kye-square*) in addition to "corpus-wise percentages" to analyse the corpora. It is applicable in situations where sample sizes differ greatly, a problem most definitely afflicting the *DN*, *DI* and inscription corpora. A χ^2-test assesses the goodness-of-fit, in this case, of two or more empirical samples' distributions of frequencies over the same set of idionyms. The test indicates the extent to which the distributions in the samples diverge based on comparing *observed* frequencies in the samples to those *expected* if they showed the same distribution. The more these two values diverge, the greater the likelihood that the samples do not originate from the same population (statistical dependence). If the distributions in the samples are very similar or even identical, the likelihood that they stem from the same distribution is high (statistical independence). The probability value (p-value) additionally provides a tool to evaluate the likelihood of observing said frequencies assuming that they are statistically independent (i.e. from the same population).

In using Pearson's χ^2-test, I have chosen a tool from inferential statistics instead of using descriptive statistics in the form of percentages, as is often the case in studies such as this. But percentages are a tool used to describe the distribution of different attributes of a statistical population; it gives no indication whether said distribution is in any way statistically significant (Sirkin 2006: 192). For a study of idionyms as potential markers of social status, it is crucial that the categorisation of an idionym rests on more than educated guesses what a certain difference in percentage might mean. Pearson's χ^2-test was therefore used to decide where a closer look at the observed difference in percentage is in order, and where it is meaningless in terms of statistical significance.

5.3.4 Prerequisites for using Pearson's χ^2-test

There are certain conditions for using the χ^2-test. The first prerequisite is that the samples be chosen randomly, meaning that every idionym has an equal chance to become part of the sample. This is very likely not the case (Section 5.2.2), at least not if the sample is supposed to represent the Norwegian/Icelandic population as a whole. Instead, the diplomataria likely present a random sample of the idionyms used amongst the manuscript-using parts of the population, but which individuals that group encompasses, is also not entirely clear. Circumstances being what they are, there is no remedy for that. It is, however, important to consider this when drawing conclusions.

The second condition is difficult to meet, as it concerns the minimum number of *expected* frequencies (not observed). This number is generally given as 5; the Bergen corpus, with its great number of idionyms with only one token, does not meet the requirements (expected frequencies are calculated on the basis of those observed). This problem can be circumvented via bootstrapping, a resampling method during which samples are taken from samples, which are then used for the actual testing. By using bootstrapping for the χ^2-tests with 10.000 reruns, expected and observed frequencies cease to matter; B=10000 in the R-code-snippets C.11, C.12 indicates the number of times the samples were resampled.

However, first the χ^2-test was used on the samples from *DI* and *DN* to determine where statistically significant deviations in frequencies can be observed. Idionyms either not appearing or listing 0 tokens in both diplomataria were removed for this test, as they would have caused errors in the calculations.[3] This leaves 182 idionyms viable for testing (Query C.8), defining the first category of idionyms in this study: those only observed in the Bryggen inscriptions. It is important to note that they may have been observed elsewhere, in other inscriptions or sagas, but not the diplomataria. This applies to 60 of 242 idionyms, although one of those is *Jón,* which needs to be subtracted (page 108), therefore bringing the number down to 59. Ten of these are not clearly identified as idionyms or bynames, two are supposedly only used as bynames and five can be used as either idionym or byname (Table 77).[4]

The last condition for using the χ^2-test is the formulation of the hypothesis to be tested. This is referred to as null hypothesis (H_0) and always assumes no statistical dependence between the samples tested against each other. The alternative hypothesis (H_1) conversely assumes statistical dependence between the samples. Statistical hypothesis testing works on the premise, not of *proving* an assumption, but on *disproving* it, by which so-called *Type I errors* should be prevented (wrongly assuming statistical dependence when there is none). H_0 is only rejected when the p-value, which is al-

[3]For clarification, by this I mean that Lind does not list the idionym, not that the idionym does not appear in either *DN* or *DI*. In IDIONYM, this is signified by the value in the respective columns being NULL, whereas if the idionym is listed, but not attested in either diplomatarium, the value will read 0. This may not seem like much of a distinction, but as far as SQL is concerned, there is a difference whether users query for IS NULL or 0, as in the first case, users literally query for entries with no value in that particular field. In the second case, users query for entries with the value 0 in that field.

[4]These are distinguished by respectively the values 0/0, 0/1 or 1/1 in the *idionym* and *byname* columns in IDIONYM, see Section 5.5.3.

ways calculated with the test, is below a certain threshold. P-value is known as the "probability value", since it represents the likelihood of the observed statistical dependence (in terms of dissimilar distributions in the different samples) being brought about by chance and not actually being representative of the statistical population.

Scholars need to decide prior to the test with which p-value they want to be working; common thresholds are p<5% (0.5) and p<1% (0.1). This translates roughly to "There is a 5% chance that this result would be observed even if the samples come from the same population." The lower the chosen p-value is, the lower the likelihood of making Type-I-errors. Although bootstrapping balances out too-small expected frequencies, I decided to use p<.01 p-value to make reasonably certain H_0 is not rejected wrongly. This raises the probability of making Type-II-errors, which in this case means that idionyms actually showing different distributions in the samples will still be considered as showing none and interpreted as coming from the same population. While this approach may certainly be criticised, considering just how close the two populations in question are in so many respects (up to and including speaking what can only be considered dialect versions of the same language), I preferred to err on the side of caution.

H_0 must always be formulated with a view to disproving it; it is therefore:

> H_0 = idionyms and manuscript corpora are statistically independent, i.e. it makes no difference for the count of idionym tokens from which country the sample is taken. The patterns in both samples correspond.

This hypothesis was now tested by using the data extracted from the onomastic tables by means of Query C.8 and the code snippet C.11, written in the programming language R for statistical computing (R).

5.3.5 χ^2-test results

The first χ^2-test comparing the diplomataria tokens returns a χ^2-value of 9669.1, indicating that there is a significant difference between the two corpora. P-value, on the other hand, is given at 0.00009999, well below p<.01. (In other words, there is considerably less than a 1% chance that these distributions would appear by chance if the name patterns in the corpora were the same.) H_0 = the distribution of idionyms is the same in both corpora, can therefore be rejected, and H_1 = the distribution is different for each corpus, has to be accepted as the new working hypothesis, supporting earlier scholarship that Norwegians and Icelanders followed different naming customs.

The sample represents only a fraction of all possible medieval idionyms used in Scandinavia, however. A careful conclusion is therefore that name patterns in Norwegian and Icelandic diplomas differ where the sampled idionyms are concerned. Since name-giving is influenced by naming customs, these likely differ as well. Yet because the diplomas represent a very specific group of individuals – people of a certain social status, who had need of manuscript writing – these results are only representative for the selection of people whose idionyms appear in the diplomataria, not for the whole of the population. Still, the result is satisfactory for the purpose of this study, as it supports the hypothesis that naming customs in the upper echelons of society in Norway and Iceland differed. There is no reason to assume that the naming patterns in other social classes could not have diverged between the two countries as well. Still, establishing clear distinction between Icelandic and Norwegian customs is rendered difficult by the close relationship of these countries, even if they developed in different directions after the initial settlement period and especially conversion had a great effect on the name-stock (Gunnes 1983; Johannessen 2002). Also, naming customs did probably not change completely during the relatively short period between 870 and the Bryggen inscriptions (ca. 1120-1413) and single idionyms from the sample may show similar distributions. The χ^2-test was therefore run again for each single idionym, checking whether distributions differ for single idionyms. With the code altered accordingly (C.12), the results indeed show that some do (Table 78):

$p<.01 = 102$
$p>.01 = 80$

80 idionyms show a p-value greater than 1%; therefore H_0 = the idionym appears with the same frequency in both corpora *cannot* be rejected. Either the distribution of these idionyms is therefore the same in both corpora or there is not enough evidence to reject H_0. Applying the χ^2-test to the single idionyms has therefore provided the means to establish two categories within the sample: 102 idionyms where use in the Norwegian and Icelandic corpora shows statistically significant differences and 80 where at present no difference in distribution can be shown. This aligns well with what previous scholarship suspected; while there are notable preferences in Icelandic and Norwegian name usage regarding the individuals partaking in manuscript writing, there are still several similarities, almost certainly owing to the fact that Icelandic naming customs were inherited from Norway. It should, at this point, be remembered though that because of the impossibility to properly date each name from the diplomataria, the samples comprise the whole period either diplomatarium covers. The results might differ drastically if a proper chronology were established.

In the absence of such a chronology, this must provide the backdrop for analysis of the idionyms in the Bryggen inscriptions and their potential relevance as markers of social status. For this purpose, a framework for interpreting an idionym's position within its group needs to be established.

5.4 Determining the potential social status of idionyms

Within the categories established by means of the χ^2-test, there is quite a range in terms of raw numbers of tokens (Table 14). In other words, some were used more, some less frequently. Without comparable corpora reflecting the naming customs of the lower social scales in Norway and/or Iceland, conclusive statements on the potential social status of an idionym are not possible at the current point in time, as to my best knowledge, such a corpus has not been compiled yet, should it even exist (cf. the hindrances in compiling name corpora from people not belonging to the upper echelons of society, for example Halvorsen 1981: 205-206). Still, if an idionym is used rarely in the manuscript corpora in general, it is more likely that it might be carried by someone who generally does not engage in manuscript writing, presupposing that the idionym is not rare in the population in general. It is therefore important to determine what is, to use Lind's words, a "well-used" idionym.

To get a better idea of the distribution of idionyms across the corpora, mean, median, standard deviation, ranges and totals were calculated for the tokens in the diplomataria (Table 14, see Sirkin 2006 for precise information on what information each provides). The mean in *DN* is 203.46, 41.90 for *DI*, a comparatively big gap which suggests that single idionyms occur less frequently in *DI* than they do in *DN*; there are different explanations as to why. To begin with, *DN* contains more diplomas from the start, so the idionyms generally have higher counts than in *DI*. However, the percentages, calculated on the somewhat shaky basis of the number of diplomas, also suggest that idionyms distribute differently amongst the Norwegian diplomas (Table 78, columns DI/6640*100 and DN/20000*100). This could also be due to other factors: *DI* could contain more diplomas in which only a few idionyms are mentioned or Icelanders did not stick as faithfully to the principle of name transfer as the Norwegians did, thereby introducing greater variation. Since the current sample is limited to idionyms appearing in the Bryggen inscriptions, the great difference in mean might also be due to the sample being prejudiced toward Norwegian name fashion, lacking the most popular idionyms from Iceland. That does indeed appear a likely reason, since the highest percentage in Norway is 7.18% (*Erlingr*), while the highest in Iceland is 3.07% (*Narfi*) (Table 78). Further sampling of different idionyms from Lind (1905-1915, 1931) might shed some light on that question.

The mean could theoretically be used to mark the difference between "well-" and "little-used", provided name spread is indeed greater in the Icelandic corpus. The data range is quite large, though: 1 to 204 for *DI*, 1 to 1435 for *DN* (Table 14). Additionally, standard deviation is greater than the mean itself for both corpora and the numbers in

Corpus	Median	Mean	Standard deviation	Range	Total
DI	24	41.90	46.37	1-204	5,978
DN	134	203.46	233.79	1-1,435	35,074

Table 14. *Median, mean, standard deviation and range of the frequency of the idionyms in DI and DN. They were calculated by using the code snippets shown in C.20; alternatively they can be calculated by Query C.21 and C.22. The statistical population for these calculations is the sum of all tokens in the respective sample.*

Table 77 suggest that one might be looking at some quite extreme outliers at the upper end of the range (the closest value to 1435 in *DN* is 1016, a gap of more than 400). The mean might therefore not be the most reliable measurement to choose in this case. Calculating it based on a selection of the data without outliers (idionyms with either very few or many tokens) is a questionable approach, since there is no comparable corpus which could be used to determine whether idionyms like *Erlingr* are statistical outliers or merely at the upper end of a scale. Stem-and-leaf plots calculated by C.20 on the same two datasets also illustrate that if outliers were eliminated at the upper end of the scale, one would also have to eliminate the main body of data at the lower end (Figures 20 and 21). This observation suggests that the phenomenon of a lot of idionyms being given to only a small number of individuals applies here as well (page 79). The distributions observed within both samples could therefore be typical.

Alternatively, the median can be used (Sirkin 2006: 90-98). Unlike the mean/average, which is calculated by using the number of tokens and the total of different idionyms, the median relies on the position of items within an ordered list and is therefore not influenced by outliers at either end of the spectrum like the mean or the size of the statistical population. It is, however, strongly influenced by the number of items in question. The median values for *DI* and *DN* are quite far off the mean's (Table 14). 50% of the idionyms in *DN* count fewer than 134 and 50% in *DI* count fewer than 24 tokens, opposed to means of 203.46 and 41.90. Since the median is calculated according to position, it might therefore be cutting off the data at too low a value.

Quartiles provide an alternative way to further examining the corpus. Again, they are based on a list of items ordered by count of token, but provide a more fine-grained division than the median. By calculating quartiles, the corpora are divided into four groups, the first cutting off the data at the point where the first 25% are reached, the second at 50%, the third at 75%, while the fourth quartile then encompasses the last 25% of the data. In practice, calculating quartiles merely means establishing two more medians, one for the lower, one for the upper half of the data, and this is problematic in the same way as using the median by itself is. It does have the benefit though of providing not two, but four groups which can then be considered by themselves and against what is already known about the corpora.

Like mean, median and standard deviation, quartiles were calculated separately for the corpora (C.20) in spite of the χ^2-test showing some idionyms with similar distribution patterns. However, calculating quartiles based on the result set encompassing all 182 idionyms would have meant including a few idionyms with 0 tokens in each corpus. Since the express purpose is to calculate quartiles with a view to establishing frequency of usage, including idionyms listing 0 tokens seemed rather counterproductive. They needed to be included in the χ^2-test samples on the basis of the respective other sample listing one or more tokens; when calculating quartiles, they could skew the results by pushing idionyms up the list. Additionally, stem-and-leaf plots as well as percentages showing how many diplomas contain certain idionyms indicate that different measures are needed regardless for Iceland and Norway (page 93).

```
> stem(onlydi)

  The decimal point is 1 digit(s) to the right of the |

   0 | 1111111122222333344445555566677788899
   1 | 11122223344456677788
   2 | 000111233334445566
   3 | 000111122225679
   4 | 01134667799
   5 | 68
   6 | 12226888
   7 | 33
   8 | 22348
   9 | 1233468
  10 | 68
  11 | 06
  12 | 3
  13 | 1
  14 | 47
  15 | 4
  16 | 9
  17 | 11
  18 | 8
  19 |
  20 | 3
```

Figure 20. *Stem-and-leaf plot of the Category-1 and Category-2-names found in DI.*

Corpus	25%	50%	75%	100%
DI	8.25	24	61.75	204
DN	23.75	134	308.25	1435

Table 15. *Quartiles for DI and DN, calculated by C.20 on the results sets from C.19.*

As Table 15 shows, the higher the quartile, the bigger the gap between the values of the previous and the quartile in question, mirroring the stem-and-leaf results, where number of idionym declines the higher up the scale one proceeds. This, again, is expected in a big name corpus: condensation causes a few idionyms to become very popular, while at the same time there is a great number of idionyms at the lower end of the scale carried by few individuals. Since we can approximate the years the diplomataria span, it appears indeed as if the lowest quartile can be considered to hold idionyms in comparatively little use among the manuscript-using population. They appear only between one and four times every century based on the following calculations:

DN spans 540 years:

$$\frac{23.75}{5.4} = 4.4 \tag{5.1}$$

DI spans 755 years:

$$\frac{8.25}{7.5} = 1.1 \tag{5.2}$$

The generational turnover is often estimated at around 30 years for the medieval period, meaning one century encompasses three generations. For *DN*, this translates to an idionym being used once or twice every generation, for *DI* to once every third generation amongst the manuscript-using population.[5] Therefore, all idionyms below the 25%-

[5] I am fully aware that this may be due to the idionym only gaining popularity at a stage or in a geographic region which the diplomataria do not properly cover. But as mentioned before, it was impossible to date/locate every

```
> stem(onlydn, scale = 6)

  The decimal point is 1 digit(s) to the right of the |

    0 | 1111111122333334446668888889
    1 | 1112334789
    2 | 112334456777
    3 | 001235
    4 | 035678888
    5 | 014
    6 | 7
    7 | 235
    8 | 04599
    9 | 77
   10 | 0
   11 |
   12 | 12478
   13 | 3579
   14 |
   15 | 45667
   16 | 045
   17 |
   18 | 24
   19 | 35
   20 | 189
   21 | 019
   22 |
   23 |
   24 | 2
   25 | 1115999
   26 | 128
   27 | 0239
   28 | 3345
   29 | 7
   30 | 899
   31 | 9
   32 |
   33 | 019
   34 | 5
   35 | 1356
   36 | 358
   37 | 7
   38 | 3
   39 | 2
   40 | 7
   41 |
   42 | 5
   43 | 0
   44 | 00
   45 |
   46 | 34
   47 | 1
   48 |
```

Figure 21. *Part of the stem-and-leaf plot of the Category-1 and Category-2-names found in DN showing the lower end of the scale with the biggest clusters.*

mark (showing values below 23.75 in *DN*, below 8.25 in *DI*) will be considered as "little used".

The second and third quartile are more difficult; since the range is so large in both corpora and there is quite a gap in number between the third and the fourth quartile, they could be regarded as the same group. The first three quartiles are all somewhat closer in range than the fourth is to the third and taking into account prior observations (Chareille 2002: 21), everything below the fourth quartile could be regarded as "little used". Yet the third quartile in both corpora starts at a value more than twice of that separating the first and second quartiles. In the third quartile, idionyms already appear up to 27 times/century in *DI*, up to 57 times/century in *DN*, using the same calculation as above. Even without knowing the total of the manuscript-using population, that is considerably more than for the first quartile. Therefore, the second quartile, below 50%, will be considered "moderately used", all idionyms in the third quartile, up to 75%, shall be considered "commonly used", and the last group "often used". This may contradict prior statements by Lind on name usage. Such statements as well as the results of this study should anyway be taken with a grain of salt, and this study in particular understands itself as a suggestion of how to tackle the problem rather than a final solution.

5.5 TAKERUN: Onomastic research tables

Before moving on to the actual results and analyses, it is once more necessary to take a closer look at where the numbers are coming from in the first place and how they are calculated. The analyses undertaken here rely on data stored within the onomastic section of TAKERUN, the first part considered to be a research database; these entity types model specific aspects of my research on the Bryggen inscriptions, while other scholars may focus on different aspects. While the research database parts of TAKERUN are all based on their own entity model, they refer back to the original core tables, for example by making use of the PKs from PATTERNING as FKs. In this instance, the purpose of using a RDBMS was to determine whether the process of counting tokens of an idionym in a corpus of runic inscriptions could be translated into an entity model which, turned into a DB, returned correct results.

Admittedly, in many cases scholars will concentrate on a small sample and look for those idionyms especially. However, as Peterson (2004, 2007) shows, there is a need for comprehensive lists of idionyms appearing in runic inscriptions, as they aid scholars in identifying and finding inscriptions easily. Rundatabas, as well, offers the possibility to look for PNs. So to aid scholars in their work, being able to trace every idionym back to all inscriptions in which it appears was one of the most important requirements. Additionally, I also wanted TAKERUN to mirror conflicting scholarly opinions and to store more than one scholar's interpretation so it would be possible to directly compare which scholar had identified which idionyms in which inscription. Given that the data was going to be digitised anyway, I considered it only feasible to design the onomastic research database to also return counts and numbers which could aid statistical analyses of the kind I was attempting. In other words, the RDBMS should do the counting of tokens of distinct idionyms in the Bryggen inscriptions for me. The resulting entity model with its technological implementation is documented in the following sections.

5.5.1 PATTERNING, SEQUENCES and INSCRIPTIONNAMES

The onomastic research database branches off from PATTERNING in the core database, as it is within this entity type (and the process it is based on) that scholars determine whether there are names in a transrunification/transliteration, and if so, how many and which. Thereafter the structure becomes more complicated (Figure 22). As explained, N:M-relationships between tables cannot exist in RDBMS, yet they would be created if names were linked directly to patterns. Additionally, each name appearing in the inscriptions can be regarded as its own separate entity, which led to INSCRIPTIONNAMES being created (Table 16). This table is built specifically to provide a unique reference for each *character sequence* identified as a name (*insnid,* inscription name id), whether that character

single occurrence from the diplomataria and use this to establish an idionym usage curve for every single idionym, so, for the time being, this crude estimate will have to do.

Column Name	Data Type	Length	PK?	Not Null?
insnid	varchar	10	true	true
spelling	varchar	30	false	false
invocation	tinyint	1	false	false
interlocutor	tinyint	1	false	false
hasbyname	tinyint	1	false	false
isbyname	tinyint	1	false	false
pmnym	varchar	1	false	false
insncom	varchar	300	false	false

Table 16. *Table structure* INSCRIPTIONNAMES.

sequence be runic or Roman (*spelling*). INSCRIPTIONNAMES also contains three BOOLEAN value attributes. *Invocation* and *interlocutor* refer to the status of the individual/entity within the inscription. These two columns play an important role for research, because a distinction needs to be made whether the idionym is used as a reference to a real person or used in a context that implies there is no real person being referred to. In the Bryggen inscriptions, interlocutor-idionyms show the names of Norse gods alongside Christian saints and Greek mythological figures. These can be given to children, but when used as a reference to the original mythological name-bearer, their value for studying the potential socio-cultural aspects of PN in Bjǫrgvin is limited. There are 35 masculine and 5 feminine idionyms appearing at least once in a context where reference to a mythological being is more likely than reference to a real person, marked in Table 77 with "Myt." following Lind's convention. Some are easily recognisable, like *Jesus*. In cases like *Óláfr* or *Sigurðr*, the distinction is not quite so clear-cut. Either can refer to a mythological being or a real person; by the time the Bryggen inscriptions are carved, it is not that long since *Óláfr hinn helgi* has died, although whether Sigurðr the Dragonslayer from the Poetic Edda was a historical person is doubtful. In marking the instances of these idionyms as *interlocutor/invocation,* I have stuck to prior interpretations (Figure 27).

The BOOLEAN columns *hasbyname* and *isbyname* indicate that the character sequence in this case is considered to be or possess a byname, for example **narfasun**, *Narfasonr,* son of *Narfi*. The *pmnym*-column marks whether it is a patro- or metronymic. This option was included to begin with, but has no bearing on the current study (a patronymic still refers to an existing person). Still, the idionyms which only appear in patronymics were marked as *isbyname:1, pmnym:p*, whereas the preceding idionyms were marked *hasbyname:1, pmnym:p.*

INSCRIPTIONNAMES serves two purposes: first, to establish the precise letter sequence identified as a name as its own entity separate from the transliteration. Secondly, even when two scholars reach the same conclusion on how to transrunify/transliterate/pattern an inscription, their results will still be added as their own separate entries in the database. The same principle applies here: character sequences in INSCRIPTIONNAMES are added by scholar.

There are two issues with only making use of PATTERNING and INSCRIPTIONNAMES, though: one, if there are two possible ways of transliterating a character sequence, but the difference does not affect the potential names, one would either have to decide with which pattern to connect the names, thereby making it impossible to reverse-search for all transliterations containing particular idionyms. Figure 23 illustrates that the letter necessitating different transliterations is the last one in the first section, potentially ᛋ judging by the transliteration. It does not influence the reading of the following character sequences, **halle:margarita.**

The sequences **halle** and **margarita** could be added twice, once for each transliteration, but this is problematic since INSCRIPTIONNAMES is supposed

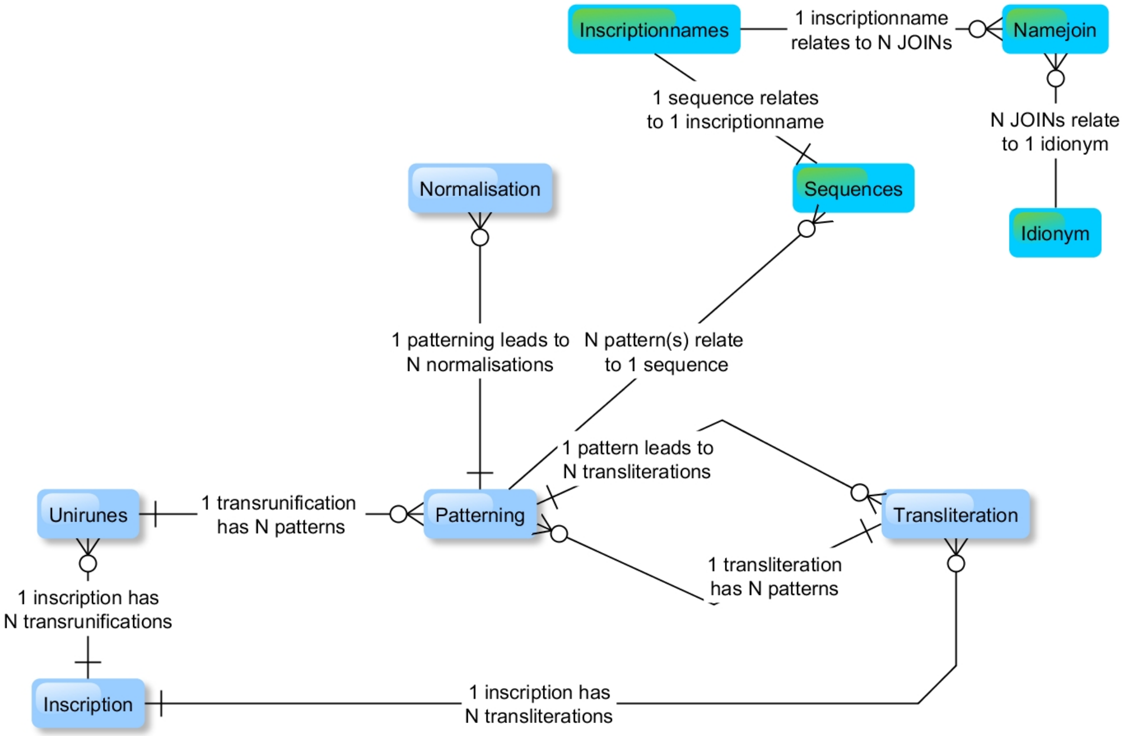


Figure 22. *Entity model including core and onomastic research tables.*

insid	tlitid	transliteration	patid	insnid	spelling	normalised
ins539	tlit2247	--]dpz:halle:ma͡rga͡rita	pat1119	insn744	halle	Halli
ins539	tlit2247	--]dpz:halle:ma͡rga͡rita	pat1119	insn808	ma͡rga͡rita	Margrét(a)
ins539	tlit2246	--]dpc:halle:ma͡rga͡rita	pat781	insn744	halle	Halli
ins539	tlit2246	--]dpc:halle:ma͡rga͡rita	pat781	insn808	ma͡rga͡rita	Margrét(a)

Figure 23. *Example of different transliterations necessitating two entries in* TRANSLITERATION*, but having no influence on the actual spelling of the names.*

insid	tlitid	transliteration	patid	insnid	spelling	normalised
ins299	tlit2017	ahe af allabogokr	pat546	insn979	ahe	Agi
ins299	tlit2018	ahi af allabogokr	pat547	(NULL)	(NULL)	(NULL)
ins299	tlit2019	ahe af allabogokb	pat548	insn979	ahe	Agi
ins299	tlit2020	ahi af allabogokb	(NULL)	(NULL)	(NULL)	(NULL)

Figure 24. *Example for different transliterations influencing the spelling of a name.*

to provide the total number of character sequences in the corpus which can (and have) be(en) identified as names. If the sequences are added two times, there are two entries too many in INSCRIPTIONNAMES. Additionally, data integrity rules are violated by doubling an entry that only represents *one* real-life item.[6] It is therefore unacceptable.

Issue two, somewhat related but slightly different, concerns the cases where transliterations directly influence name spelling, exemplified in Figure 24. Again, the two different sequences could be added as their own entity in INSCRIPTIONNAMES, accounting for the spelling. They would still only refer to *one* actual item, though. The problem is exacerbated by most scholars relying on transliterations instead of transrunifications. If the entry were linked to the runic instead of the Roman sequence, the character in question would simply be represented by ᛁ.

These issues have to be resolved differently. The first one can be remedied by another JOIN table between PATTERNING and INSCRIPTIONNAMES, called SEQUENCES (Figure 22 and table 17). It is designed to avoid adding the same character sequence several times. To spare scholars the trouble of either choosing only one transliteration to attach the names to or having to attach them three times, *patid* and *insnid* are combined in SEQUENCES to create the link. This way, both patterns refer to the same two entries in INSCRIPTIONNAMES (Figure 23). These remain unique, and so is the link in SEQUENCES, since the two columns form the compound PK. Creating the same link twice by accident or design is therefore impossible.

The second issue cannot be solved by introducing more JOINs, unless one were to take the inscription apart character by character. E is not i, no matter how one looks at it. One solution would have been to delete the *spelling*-column completely; however, how would another scholar then be able to identify the character sequence in question? In the end, this approach was deemed too confusing. Instead replacement characters (RCs) were introduced. Their purpose is very simple, in

Figure 25. *Replacement character.*

Figure 26. *Uncertainty sign.*

that they stand for another character, which for some reason cannot be displayed. In INSCRIPTIONNAMES, the RCs are used to signify that a certain character can be identified in more than one way and scholars should refer to the transliterations for clarification. RCs are therefore only used in cases where the transliterations present alternatives of how the name could be spelled. They are not used when a different reading results in identification of a verb or a noun rather than a name.

Unicode offers a bespoke RC at code point U+FFFD (Figure 25). This could have been used, but technically, the characters *can* be displayed. There is just no agreement on which character *should* be displayed. Therefore, the uncertainty sign at U+2BD1 was chosen instead. Unfortunately, this character, which should look like Figure 26, is not yet present in many fonts.

In lieu of finding a font containing this particular sign and following the example of West (n.d.[b]), I have taken the liberty of instead injecting ✳, the presently still unencoded Symbol of Chaos in its stead into the bespoke font I created as a result of experimenting with runic encoding in Chapter 3. Since *spelling* mainly serves as a crutch to help scholars identify the sequences in question, this was deemed acceptable; searches for specific spellings of idionyms can still be run by including

[6] Theoretically this also applies to the sequences added several times because of different scholars, but this problem can be solved more easily.

Column Name	Data Type	Length	PK?	Not Null?
patid	varchar	9	true	true
insnid	varchar	10	true	true

Table 17. *Table structure* SEQUENCES.

Column Name	Data Type	Length	PK?	Not Null?
insnid	varchar	10	false	true
idioid	varchar	10	false	true
source	varchar	30	false	false
sourcepg	varchar	8	false	false

Table 18. *Table structure* NAMEJOIN.

transliterations. By way of SEQUENCES and RCs, INSCRIPTIONNAMES is now restricted to contain exactly what it represents as an entity type: unique character sequences identified as names. It is therefore also possible to use SQL for calculations and to automatically update other tables (Section 5.5.5).

5.5.2 NAMEJOIN

Still missing from the entity model is the part where sequences are normalised, since INSCRIPTIONNAMES itself does not provide the normalisation of the character sequence. This was done for good reasons: even if scholars can agree on the character sequence identified as a name, it does not follow that they agree on which idionym it should be normalised as. While the N:M-relationship between PATTERNING and IDIONYM was avoided by introducing SEQUENCES and INSCRIPTIONNAMES as separate entity types, linking the latter directly to IDIONYM would only push the issue back one table, as N character sequences would then be identified as M idionyms. Resolving the N:M-relationship required introducing another JOIN table, called NAMEJOIN. It uses two FKs as a compound PK, *insnid* and *idioid* to prevent inputting the same combination twice. It also contains two columns that INSCRIPTIONNAMES lacks: *source* containing the bibtexkey and *sourcepg*, providing literature and page reference where this particular normalisation can be found.

Source, so far present in every table representing an entity type, was not included in INSCRIPTIONNAMES because INSCRIPTIONNAMES and NAMEJOIN are linked by *insnid* and IDIONYM must be linked to INSCRIPTIONNAMES through NAMEJOIN. It is this juncture that needs to be referenced properly, the decision to which idionym to normalise a character sequence, not so much the character sequence in itself, although, if required, these columns could easily be added to INSCRIPTIONNAMES as well.

NAMEJOIN links to the final table in the onomastic research database, IDIONYM.

5.5.3 IDIONYM

IDIONYM stores all idionyms found in the Bryggen material (Section 5.6) as well as additional information about the idionym itself, like origin or number of tokens in other corpora. The backbone of the entity type's content is formed by the idionyms identified by Markali (1983), which represents the most thorough study of PNs in the Bryggen inscriptions. Where necessary, i.e. where an idionym was not included in her original list, it was added to the table as well (refer also to Section 5.6 for more information on the table's actual contents).

According to this table, up to 242 different idionyms are attested in the Bryggen inscriptions, some of which appear up to 19 times within the corpus. This count includes idionyms, idionyms only found in bynames, bynames and names which cannot be conclusively identified as idionyms, but are suggested by Uppsala runforum 2014; Liestøl & Johnsen 1980-1990 or (Markali 1983). Some of the idionyms may be open for discussion, since it

Column Name	Data Type	Length	PK?	Not Null?
idioid	varchar	9	true	true
normalised	varchar	40	false	true
idionym	tinyint	1	false	true
byname	tinyint	1	false	true
gender	varchar	2	false	false
origin	varchar	10	false	false
di	int	6	false	false
dn	int	6	false	false
sverressaga	int	6	false	false
hakonarsaga	int	6	false	false
tollruller	varchar	6	false	false
bergeninsid	tinyint	2	false	false
bergeninsnid	tinyint	2	false	false
insnidnoin	tinyint	2	false	false
idiocom	varchar	150	false	false
idiosource	varchar	30	false	false
idiosourcepg	varchar	8	false	false
lindlocalisation	varchar	1	false	false
pred	varchar	2	false	false
sostat	varchar	5	false	false
quarti	int	1	false	false
quartn	int	1	false	false

Table 19. *Table structure* IDIONYM.

is by no means certain that the idionym identified is actually the one intended by the rune-carver, for example INS65, which reads **binitik[k<t]t a**, where **a** can be read as part of the name, which would then be *Benedikta*. Yet it can also be understood as the OWN 3.pers.sg. form of the verb *eiga*, *á*, in which case the inscription translates as *Benedikt owns*. Although for example (Markali 1983) ponders the likelihood of the idionym being identified correctly, the question often cannot be resolved satisfactorily. I decided to err on the side of caution and include such cases in IDIONYM. The decision was guided by the reasoning that an idionym being uncommon or unknown within the known Norwegian corpus is not sufficient reason to exclude it from the name corpus of a town that was repeatedly shown to house people of several different ethnic and linguistic backgrounds. Much the same applies to previously unattested idionyms like *Agnbjǫrg*.

Beside the obligatory PK *idioid* (idionym id), *normalised* contains a standardised spelling of the idionym (see Section 5.6 for issues concerning normalised spellings), and *idionym* and *byname*. The latter were designed as BOOLEAN to account for the possibility of an idionym being both used as an idionym and a byname (patronymics are not considered bynames, because every idionym can function as one). *Gender* indicates whether the idionym can be used for men, women, or either by the letters *m*, *f*, *mf*, and additionally offers the possibility of being set to NULL in cases where it is not possible to determine which gender the idionym indicates. This only refers to grammatical gender of the idionym, although in the majority of cases, that will coincide with the perceived gender of the name-bearer (page 77; *Auðr* being the exception, which can be used by men and women alike).

DI and *DN* contain the numbers based on the counting of tokens in Lind (1905-1915, 1931). Calculations and statistical analyses are based on the numbers stored within them, which in turn were entered manually after counting the tokens.

Bergeninsid, bergeninsnid and *insnidnoin,* in contrast, are dynamic columns. The first contains the maximum count of inscriptions where this particular idionym might occur, while the latter two contain the maximum count of tokens, once in total and once with *invocations* subtracted (Section 5.5.5 for how these columns are updated based on the query results from the whole onomastic research database).

Sverressaga, hakonarsaga and *tollruller* contain numbers from corpora which were also used as a means to shed more light on the Bryggen corpus (Section 5.7.2). *Origin,* while it should probably have been its own entity type, provides information on which language the idionym is originally taken from, i.e. whether it is etymologically Scandinavian or can be traced back to Aramaic, Greek, German or Latin imports. This column hardly does the complicated history of borrowed idionyms justice, but since neither this study nor TAKERUN was aimed at providing a full history of an idionym's way into medieval Norway, it was deemed sufficient for the purposes.

Idiocom is the generic comment-column included in every table, which also goes for *idiosource* and *idiosourcepg*. The letter stored in *lindlocalisation* indicates where Lind (1905-1915, 1931) thought the idionym was used predominantly (Section 5.7). The last four columns, *pred, sostat, quarti, quartn* are once again columns meant to be updated according to the results of the statistical calculations presented in Section 5.4. *Pred,* for example, indicates in which country a particular idionym shows a higher relative frequency, while *sostat* is updated based on this and the *quarti/quartn*-columns to mirror the social status as well as the country prevalence of an idionym.

Data entry and retrieval into/from the onomastic research database are illustrated next, clarifying how it is supposed to be used and why its structure is so complicated.

5.5.4 Data entry

The inscriptions chosen for this purpose are INS12 and INS108. INS12 has two sides: a reads **aria**, b **santi:ulab**. While the names are spelled the same regardless of transliteration, the patterns for the b-side differ. Side a is by general consensus identified as the OWN phrase *Ari á, Ari owns.* Side b however could read either *Sancti Ólafr,* referencing the Norwegian king-turned-saint *Ólafr hinn helgi*, or it could be the OWN verb *sendi,* thus translating to "Ólafr sent/may send" (Liestøl & Johnsen 1980-1990: 24-25; Uppsala runforum 2014). Either way, the name is *Ólafr,* which is reflected in the two patterns for side b: Figure 28. The transliteration is duplicated in the result set because it relates to two different patterns.

The process of adding said patterns is visualised in Figure 27, with the difference consisting of the BOOLEAN values in the OWN and LATIN fields. *Patids* are then added to SEQUENCES, along with the PK for the name character sequence, INSN431. The crucial link is created between one *insnid* and both *patids*. One transliteration thus links to two patterns to one character sequence. All that remains is to create the link between INSCRIPTIONNAMES and IDIONYM by connecting character sequence to normalised idionym by adding the combination of *insnid* and *idioid Ólafr* to NAMEJOIN. The crucial step here is to make sure that *all* possible patterns for a particular transliteration are connected to the same character sequence and that no second entry is created in INSCRIPTIONNAMES despite there being contradictory patterns. In this particular case, *interlocutor* and *invocation* in INSCRIPTIONNAMES need to be set to 1 to reflect that this particular instance could refer to a real person or a saint (page 98). It also impacts query formulation (Section 5.5.5).

The second example has a different catch: the idionym in INS108 cannot be identified with complete certainty. The actual inscription reads either **kolbiạna** (Markali 1983: 64), *kolbiọna* (Liestøl & Johnsen 1980-1990) or *kolbiøn a* (Uppsala runforum 2014) (Figure 29). The latter two agree on normalising the name in question as *Kolbjǫrn;* Markali (1983) offers *Kolbeinn* as an alternative. Figure 27 illustrates the differences in process to the prior example: the process is straightforward until NAMEJOIN, where two entries need to be created to properly link the character sequence to both potential normalisations (also Figure 29).

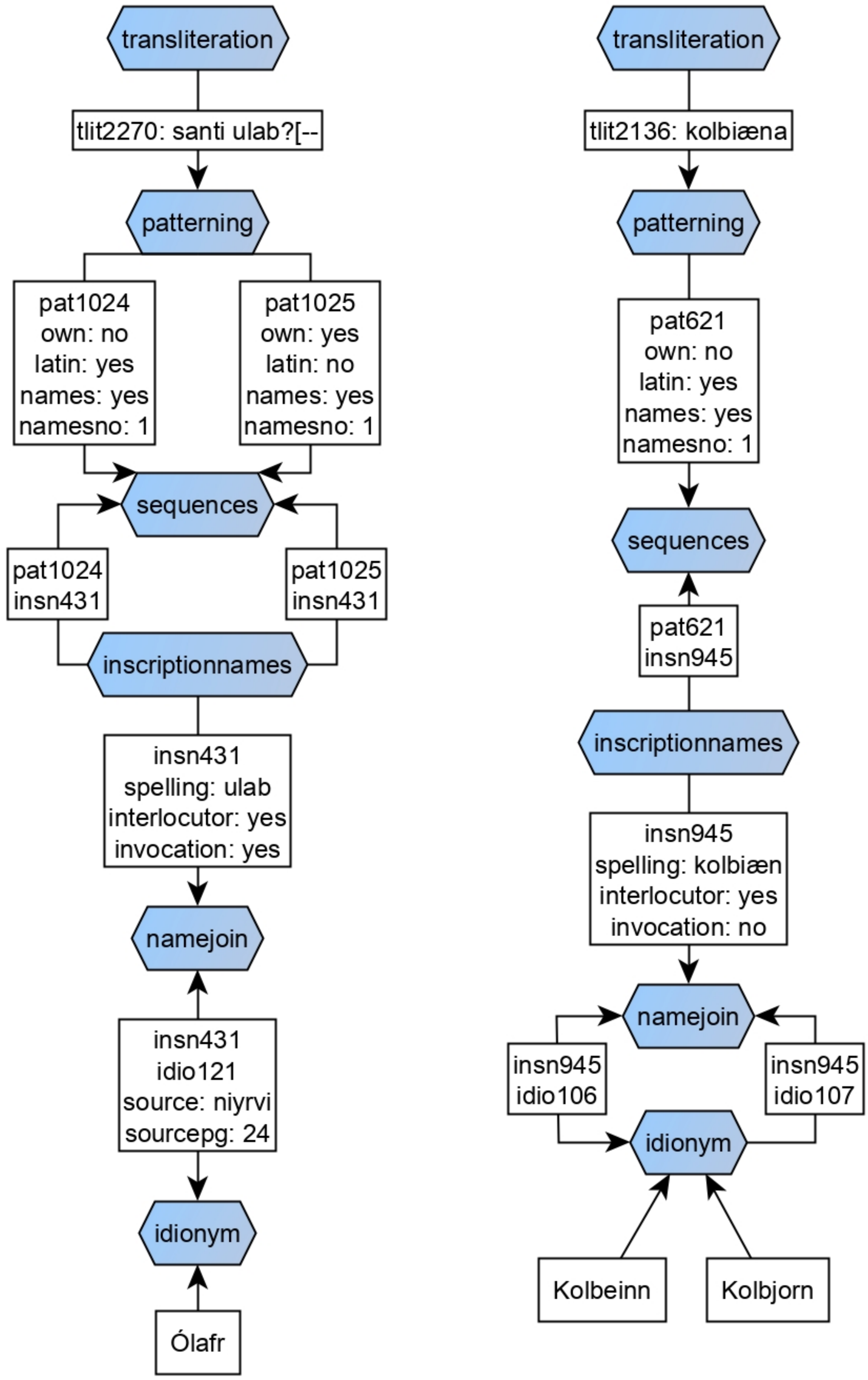


Figure 27. Two examples of adding data to the onomastic research database, INS12 left and INS108 right.

tlitid	*transliteration*	*patid*	*own*	*latin*	*names*	*namesno*	*insnid*	*spelling*	*interlocutor*	*invocation*	*normalised*	*tlitsource*
tlit2129	aria	pat549	1	0	1	1	insn628	ari	1	0	Ari	markali1983
tlit2130	santi ula͡b?[--	pat550	\N	\N	1	1	insn823	ula͡b?	1	1	Ólafr	markali1983
tlit645	aria	pat399	1	0	1	1	insn430	ari	1	0	Ari	niyrvi
tlit2270	santi ula͡b[.- -	pat1024	0	1	1	1	insn431	ula͡b	1	1	Ólafr	niyrvi
tlit2270	santi ula͡b[.- -	pat1025	1	0	1	1	insn431	ula͡b	1	1	Ólafr	niyrvi
tlit2308	ari a	pat803	1	0	1	1	insn2	ari	1	0	Ari	samtextbas
tlit12	santi ulab- ...	pat27	1	0	1	1	insn3	ulab	1	1	Ólafr	samtextbas
tlit12	santi ulab- ...	pat802	0	1	1	1	insn3	ulab	1	1	Ólafr	samtextbas

Figure 28. *The result set from TAKERUN when running a query for the first example from Figure 27 and section 5.5.4.*

tlitid	transliteration	patid	own	latin	names	namesno	insnid	spelling	interlocutor	invocation	normalised	tlitsource
tlit2136	kolbiæ̨na	pat621	1	0	1	1	insn945	kolbiæ̨n	1	0	Kolbeinn	markali1983
tlit2136	kolbiæ̨na	pat621	1	0	1	1	insn945	kolbiæ̨n	1	0	Kolbjǫrn	markali1983
tlit743	ko͡lbiø̨na	pat496	1	0	1	1	insn574	ko͡lbiø̨n	1	0	Kolbjǫrn	niyrvi
tlit109	kolbiøn a	pat121	1	0	1	1	insn150	kolbiøn	1	0	Kolbjǫrn	samtextbas

Figure 29. *The result set from TAKERUN when running a query for the second example from Figure 27 and section 5.5.4.*

The question may be asked which purpose the complicated entity model of the onomastic research database serves. A case could be made that a scholar's job is to decide which interpretation to support based on evidence. This would void the need to accommodate possible variations; besides, if every possible interpretation is to be considered, the DB might contain several entries which most scholars would disregard for weakness of argument. This is undoubtedly true, but fails to recognise the purpose of TAKERUN and the nature of the data. The entity model only reflects the real-life circumstances, which are such that a clear-cut decision which interpretation is the more reliable is impossible to make at times. Deciding on one may be the right way to go when arguing a point, but that is not what TAKERUN was built to do. On the contrary, it is supposed to support scholars in deciding which interpretation they deem the most reliable by enabling them to compare as many of them as possible. This cannot happen when the choice is already limited by prior decisions to exclude certain data (cf. page 33). Therefore even interpretations from an unpublished master's thesis are entered. It is not a question of quantity over quality, it is one of providing the fullest record possible of scholarship on a particular inscription. Regardless of whether one agrees with an interpretation, it is still part of the research done on the object. Nothing prevents a scholar from exporting a result set and excluding particular interpretations from it. This can even be done in the RDBMS itself when querying for particular aspects. As this is one of the most important tasks of TAKERUN, the next section will focus on how result sets are obtained.

5.5.5 Data retrieval

A DB is useless if it is not possible to retrieve meaningful results from it. Basic query formulation was explained in Section 4.7.1; here it is necessary to delve into how data modelling impacts on data retrieval and retrieving result sets with the purpose of using them for research. The core database was built with a view to how runological data could best be stored, while the onomastic research database is an example of how TAKERUN can be expanded to support a variety of research questions. In the interest of fluent reading, only the thought process behind a query is outlined; the queries themselves are provided in Chapter C.

Before a query is written, one needs to be clear on what one needs the result set for. I wanted TAKERUN to do three things:

1. link all idionyms back to the inscriptions in which they appear;
2. store and return prior interpretations;
3. count the Bryggen tokens of different idionyms.

Together with the count of tokens from Lind 1905-1915, 1931 in the *dn-/di-*columns in IDIONYM (Query C.3), these are the basis of all statistical analyses of the material. Counting the Bryggen tokens is not an easy task, though. Due to the nature of runic inscriptions, a character sequence may or may not be identified as a name, may be normalised as one or more different idionyms and may have been normalised (differently) by different scholars. Scholars may have looked at the whole corpus or only some part of it, concentrated on inscriptions of a particular type or restricted their study to specific idionyms. (Markali 1983), for example, did not consider PNs not referring to real people (marked *invocation* in IDIONYM).

One potential way of doing this would be to query for all idionyms and their tokens; the result set looks similar to Figure 28. Then each entry can be evaluated by itself. The other option is to make the RDBMS do the work and get the counts out of the data collected in TAKERUN. The retrieval process requires some thought, care and knowledge of the entity model, though. A full list of all idionyms identified in the corpus is the starting point for either approach. From TRANSLITERATION, all tables until IDIONYM are included in this query, contributing different bits of information to the final result set:

1. TRANSLITERATION: *insid, tlitid, transliteration, tlitsource*;
2. PATTERNING: *patid, own, latin, nonlexical, names, namesno, bynames, bynamesno*;
3. INSCRIPTIONNAMES: *insnid, spelling, interlocutor, invocation*;
4. IDIONYM *normalised*;

The result set can further be restricted and sorted by

1. *names* in PATTERNING is 1 (only inscriptions containing names);
2. *insid, tlitsource, tlitid, insnid* in exactly that order, as it first sorts the result set by the PK of the inscription, thereby keeping all entries for the inscription together, then by scholar, thirdly by *tlitid,* which equates one side of the inscription, and finally by *insnid* to make sure that different interpretations of the same character sequence still appear together.

The sorting is mainly for the purpose of counting manually, though, as are several of the fields included in the query. The six tables the query runs through need to be linked by means of the JOIN-clause as explained in Section 4.7.1.[7] Running Query C.5 returns 1063 results, which can then either be exported and printed for manual counting, or used as a basis for further queries. For automatic counting, only *insid, insnid, normalised/idioid* and *tlitsource* are important. Restricting the query to these and using DISTINCT returns only 1005 results (the multiplied entries are from examples like Figure 27, which would have to be subtracted when counting by hand).

Once done, a new query can be built on top, a process called “query nesting” or “subqueries”. It refers to running several queries in one go by including one in the other; they are then run from the innermost to the outermost query, with the result set only being shown after the last query has finished. Running them one after another is possible, but the result sets must be saved as so-called VIEWs, which are then queried in turn, a more arduous and slower process (similar to how result sets can be narrowed down in *Rundatabas*). In this example, the new query uses the COUNT function to add up all distinct *insids* and *insnids,* but, and this is very important, counting them by normalised idionym and scholar who identified this normalisation (GROUP BY) to avoid adding up interpretations by different scholars in the total count. The new result set now shows how many tokens of a particular idionym single scholars count in the Bryggen inscriptions. This is important because neither *NIYR VI* nor Markali (1983) list the idionyms from the whole corpus; only *Rundatabas* contains a (mostly) full account of all idionyms. The counts by scholar therefore vary significantly. To alleviate this problem and thanks to how the data is structured, the maximum number of tokens for one idionym can be calculated, though, by com-

[7] Although, as can be gleaned from Query C.5, I am using a LEFT instead of an INNER JOIN. w3schools (2020) explains the basic difference between INNER, LEFT and RIGHT JOINs.

paring the tokens counted by individual scholars and selecting the highest count. Therefore a third query is built on top using the MAX() function and disregarding *tlitsource* (Query C.6). So, by running one single nested query, the maximum count of one idionym's tokens in the Bryggen corpus can be calculated, which saves about four days of work counting manually, done to verify that the queries worked in the intended way. If new tokens/idionyms are identified in the corpus, as long as they are added in the same way as the others, the result set will then include those when Query C.6 is run anew. Moreover, the result set from this query can be used to run an UPDATE query on IDIONYM, automatically adding the counts to *bergeninsid* and *bergeninsnid*. This way, errors in manually copying numbers are avoided.

The downside is that using the maximum number of tokens as calculated per this approach is only feasible if the studies from which the names are taken examine approximately the same inscriptions. In this case, the three works used clearly state the range of inscriptions they are covering. Based on this information, I knew that *NIYR VI* was likely to return the fewest, *Rundatabas* the most tokens, with Markali (1983) somewhere in between. I also knew that the latter would not list any idionyms marked as *invocation* in INSCRIPTIONNAMES since her study focuses on PNs. The other two works provided information about idionyms referring to mythological beings. If working with a DB where the data background is unknown, there is always the danger that one scholar identifies one *Ari* in one inscription, while another scholar finds a second one in a second inscription, without mentioning the first. Then the maximum tokens for *Ari* in the whole corpus would be wrongly returned as 1 by this query, because each scholar has only identified one. In such cases, it is more feasible to use a query returning a result set which lists maximum number of tokens *per inscription* by scholar. These two result sets can then be compared with the help of the RDBMS by using IN, NOT IN and subqueries. Theoretically this applies to my dataset as well, but having reviewed it manually, I am reasonably certain this is not the case and the scholars for the most part disagree on the normalisation.

One last catch needs to be mentioned, tying in with the problem already discussed in Section 5.5.1: *Ólafr* can either be identified as an interlocutor or as an invocation (Section 5.5.4), while this study looks at PNs. In TAKERUN, a token referencing a supernatural/mythological entity is indicated by the *invocation*-value in INSCRIPTIONNAMES being set to 1. In this case, *interlocutor* and *invocation* in IDIONYM need to be set to 1 to reflect this fact; the relevant columns are included in INSCRIPTIONNAMES because this is decided on a case-by-case basis. This character sequence therefore appears in result sets with the WHERE-clause *interlocutor=1* or *invocation=1* – in other words, appears in a map showing inscriptions referring to real people and in one showing the distribution of inscriptions with invocations. To avoid this, a second WHERE-condition needs to be added so that the phrase reads

```
WHERE interlocutor=1 AND invocation=0
```

Whenever using Query C.6, I therefore ran it two times, first with this WHERE-clause and then without to see the difference. Table 77 illustrates that the counts for some of the idionyms changes noticeably once *invocation*-names are excluded. Still, the idionyms to which tokens marked with *invocation* refer were included in the χ^2-test for the diplomataria, along with all other idionyms attested in the inscriptions, because in the diplomataria, they refer to real people. Some of them, along with other tokens where the normalisation presented difficulties, are listed in the next section taking a closer look at the contents of IDIONYM.

5.6 Survey of the names in IDIONYM

IDIONYM contains the normalised versions of the names appearing in the Bryggen inscriptions; however the spelling of these normalisations by themselves differs between scholars. For the most part, Lind (1905-1915, 1931) and Markali (1983) normalise the same way, but in some cases, they follow different customs, e.g. Lind preferring -i- over -j- to express /j/. IDIONYM provides both variations separated by /. In other cases, however, they disagree on how much difference in spelling justifies identifying a combination of runes/letters as a different form of the idionym. The list below provides an overview and also lists other cases requiring a more detailed explanation, with the whole list presented in Table 77.

- *Andreas/Andrés:* Lind (1905-1915, 1931) list both variations as the same, Markali (1983) none.
- *Eygísl/Eygils:* while *NID* only lists the former, *NID-S* only lists the latter. Considering the first entry in *NID* is "Oygils", it seems reasonable to assume that Lind did not distinguish between the variations. Markali (1983: 58) as well as Kruken (2013) make a point about -*gísl* having turned into -*gils* over the course of time, and in terms of dating, this is of course an important factor, even if it may well be a misspelling in the inscriptions. Besides, with the Bryggen inscriptions being archaeologically (therefore independently) datable, normalising to the same idionym was deemed more reasonable. Should the inscriptions in question turn out to date to different periods, this would provide sufficient reason to return to the original spelling and determine whether there are convincing chronological reasons to normalise differently.
- *Eyjolfr/Eyiólfr:* another possible normalisation is *Eyjulfr/Eyiúlfr,* but since Lind (1905-1915, 1931) and Markali (1983) normalise with -o-, it was kept streamlined.
- *Gyrðr, Gyrid, Gyrðir, Gýriðr:* while Lind (1905-1915, 1931) lists *Gyrðr, Gýriðr, Gýríða* and Markali (1983) only suggests *Gyrðr* as a normalised form, *Rundatabas* normalises two tokens as respectively *Gyrid* and *Gyrðir.* Unfortunately, neither is to be found in Lind 1905-1915, 1931, so while they have been added as potential normalisations, they have to be treated with care. *Rundatabas* gives no information on where the normalisation originated.
- *Hallgísl/Hallgils:* lacking the first as an entry, the numbers pertaining to *Hallgils* were used instead, but there are no tokens in *DI* or *DN.* Compare *Eygísl/Eygils*.
- *Herikr:* not in Lind (1905-1915, 1931), Markali (1983: 36) lists it as an alternative to *Eiríkr* in one inscription (Markali 1983: 23).
- *Hrólfr (Rolfr):* the latter is a modern spelling of OWN *Hrólfr,* which appears as such in Lind (1905-1915: 587) and was given preference.
- *Ió(h)an/Jón:* every token of *Jón* or *Jóan* is listed under *Jóhan* in Lind (1905-1915: 647, 1931), although Markali (1983: 38-39) lists *Jó(h)an-* and *Jón*-tokens separately. Since one is disyllabic and the other monosyllabic, and it is possible in runic orthography to determine which version it is, they were given their own entry each; where calculations are concerned, the sum is used. *Jóan* and *Jóhan* are not distinguished.
- *Johannes:* while *Ió(h)an/Jón* are variations of this idionym and counted as tokens of only one variation due to Lind's approach, *Johannes* is listed separately. Not only is it trisyllabic, it is also the saint's name. It may have been used as a PN, but as this has not been studied yet and with a view to what this study is trying to accomplish, it was deemed opportune to differentiate.
- *Margrét(a):* Lind (1905-1915: 760) lists *Margrét* and *Margréta* as separate idionyms, yet a look at the tokens reveals that the same potential form can be counted as either (for example *Margrétta,* which appears in the list for both in column 761 and 762, albeit from different diplomas). In *NID-S*, they are there listed as one, which Markali (1983) does as well. They are not distinguished in this study.
- *Michael/Mikiáll:* similar to *Johannes* and its variations, in cases where *Michael/Mikiáll* are used, it can be difficult to establish whether the saint or a real person are referred to. In the Bryggen material, it is most likely the saint, whereas the entries listed in Lind (1905-1915, 1931) appear to refer to existing people. It was therefore included in the analysis as a potential given name, regardless of who it refers to in the Bryggen material, as it may be

important as an indicator of different name patterns (*María* was included for the same reason).

- *Þorgísl/Þorgils:* Like *Eygísl/Eygils,* only the latter is used in Lind (1905-1915, 1931) and Markali (1983). A similar rationale applies to not differentiating between *Þorgísl/Þorgils* and *Þyrgísl/Þyrgils* at this point in time. Markali (1983: 58) states that there is little reason to prefer a reading of ᚯ as -**y**- over the more common reading -**o**-. At present, waiting for further onomastic research to decide whether these two variations are, in fact, distinct or simply came about owing to different transliteration traditions is preferable. The pertinent information is available is in the *spelling*-column and can be called up at any point in time.

- *Týhvatr/Tivatr:* Lind (1905-1915, 1931) normalises as the former, Markali (1983: 67) as the latter, therefore both variations are given, although they are spelled quite differently.

With these peculiarities now explained, the χ^2-test run and different groups of idionyms established, interpretation of the results concerning potential social implications can be attempted.

5.7 Social stratification of the Bryggen idionyms

Since the aim of this particular study is to establish whether it is possible to make educated guesses at the potential social status of the Bjǫrgvin rune-carvers, the χ^2-test results for the diplomataria provide the backdrop against which the appearance(s) of an idionym in the Bryggen inscriptions is/are interpreted. The χ^2-test is also used for direct comparison of the Bryggen corpus to either of the diplomataria to determine whether they markedly differ in frequency of idionym usage. Based on the test (page 92) results and the two groups into which it divides the corpus, the following categories are established:

1. Idionyms with a significant difference in use between the corpora = idionyms where H_0 could be rejected = idionyms where p<.01
   a) Idionyms with a higher frequency in *DI* (*DI* > *DN*)
   b) Idionyms with a higher frequency in *DN* (*DN* > *DI*)
2. Idionyms equally in use within both corpora = idionyms where H_0 could not be rejected = idionyms where p>.01
3. Idionyms appearing in neither diplomatarium

Category 1 comprises all idionyms where the difference in use is significant, while Category 1a and 1b focus on where the idionym is more common. This is decided by the relative frequency of the idionym within one corpus, where the relative frequencies/percentages are calculated based on the total sum of tokens in each corpus: 5,978 in *DI*, 35,074 in *DN* and 409 from Bryggen. For example, *Anna* occurs eight times each in *DI* and *DN*. However, due to the vastly different sizes of the two corpora, the relative frequency of *Anna* in *DI* is 0.13%, while in *DN* it is only 0.02%. Since the χ^2-test affirms that in this case, the difference in relative frequency is significant, *Anna* can be considered more frequent in *DI* than *DN*, although the difference in percentage seems negligible. The idionyms from Category 1 distribute as shown in Table 20.

By some inexplicable, but entertaining coincidence, both subcategories contain exactly 51 idionyms. Some of the idionyms in either subcategory were assigned to one or the other country already by Lind. Within 1b, his localisation corresponds to where the χ^2-test results indicate the idionym is more common. In Category 1a, on the other hand, there are two exceptions. One of them is *Ragnarr,* which Lind (1905-1915) considers Norwegian, while the test results place it in the Icelandic group (Query C.18). The same applies to *Didrik*. For the majority of idionyms in Category 1, though, he does not give any indication of the prevalent country, at least not in the sense that he would clearly designate them as “N./Isl.”. Since this study does not consider evidence from sagas and other documents, the test results are given preference over his opinion on the matter and the idionyms in Category 1 regarded as either “predominantly

	DI > *DN* = 1a	*DN* > *DI* = 1b
A	Ámundi, Anna (f), Ari, Arnbjǫrn, Arni, Ásgrímr	Arnbjǫrg (f), Ása (f), Áslákr, Auðun
B	Benedikt, Bergþórr, Brandr, Búi	Bárðr, Bergsveinn, Birgir, Bótolfr
D	Didrik	
E	Egill, Eindriði, Eldjarn/Eldiárn, Erlendr, Eyjolfr/Eyiólfr	Eiríkr, Erlingr, Eysteinn, Eyvindr
F	Finnr	Fólkvarðr
G	Gísl, Glúmr, Guðríðr (f), Gunnsteinn	Guðrún (f), Gyrðr
H	Hákon, Hálfdan	Halldórr, Hallvarðr, Haraldr, Hávarðr, Helga (f), Helgi, Hrólfr (Rolfr)
I	Illugi, Ími, Ingimundr	Ívarr
J		Jórunn/Iórunn (f)
K	Kárr, Kolbeinn	Karl, Klémetr, Kolbjǫrn
L	Ljótr/Liotr	Lafranz, Loðinn
M	Markús, Mat(t)heus	
N	Narfi	Nikulás/Nikolás
O/Ǫ	Oddr	Ǫgmundr, Ólafr, Ǫlvir/Ølvir, Ǫnundr, Ótto
P		Pétr
R	Ragnarr, Rúnolfr	
S	Sighvatr, Skeggi, Sǫlveig (f)	Sigurðr, Símon, Smiðr, Steinarr
T	Thomás	
V	Vémundr, Vígdís (f), Vilhelmus/Vilhiálmr	
Y	Yngvildr (f)	
Þ	Þorbergr, Þorbjǫrg (f), Þorfinnr, Þorgrímr, Þórhallr, Þorlákr, Þorvaldr, Þorvarðr	Þólfr, Þóraldi, Þóraldr, Þorbjǫrn, Þórðr, Þorgarðr, Þorgeirr, Þorgils/Þorgísl, Þórir, Þorkell, Þorsteinn

Table 20. *Distribution of the idionyms in Category 1a (51) and 1b (51) (H_0 rejected).*

Icelandic" (1a) or "predominantly Norwegian" (1b). "Predominantly", in this case, has to be understood from the statistician's point of view: these idionyms appear more frequently in one of the corpora. It does not mean they are exclusively used by Icelanders/Norwegians, nor should the term be understood to imply they were coined in Iceland/Norway. There is certainly no quantification attached of how frequently an idionym would have been used in Iceland/Norway as compared to others in the same corpus, although especially the first is a frequent assumption, for example in (Johnsen 1987: 735). The percentages in Category 1a range from *DI*=0.08%, *DN*=0.00% (*Ími*) to *DI*=3.41%, *DN*=1.19% (*Narfi*), thereby exemplifying that significant differences need not only apply to idionyms which occur many times in one of the corpora and very few in another. Category 1a-idionyms span almost the whole range of percentages observed in the *DI* sample and have therefore likely not been in equal usage in Iceland either (excepting feminine idionyms, since their lack in written sources can be attributed to a variety of reasons). The same holds true for Category 1b, even if the percentage range is greater than in the first group, from *Fólkvarðr*, *DN*=0.13%, *DI*=0.00% to *Erlingr*, *DN*=4.09%, *DI*=0.82%.

5.7.1 Predominantly Icelandic idionyms

Finding *Egill* in Category 1a is no surprise, Egill Skallagrímssonr being a famous Icelandic skald living in perpetual conflict with the Norwegian royal family, detailed in his saga. Others are more of a surprise, especially *Vilhelmus/Vilhiálmr* and *Didrik*. These are foreign idionyms not connected to Christianity like for example *Markús*. *Vilhelmus/Vilhiálmr,* originally from Old High German (Kruken 2013: 599), in particular has been ascribed to either ties to the Orkneys or marriages in England when it appears in Norway (Halvorsen 1984: 121, 1975: 165). However, according to the χ^2-test, it is more commonly found in Icelandic diplomas. Perhaps this might be owed to close ties existing between Iceland and the Orkneys and England as well.

Another interesting factor is the distribution of *Þór*-idionyms. Apparently each country had preferences concerning god-inspired idionyms. The only idionym with *-þórr* as its second theme, *Bergþórr,* sorts into Category 1a as well.

The ratio of feminine to masculine idionyms is 6:45 in Category 1a, 5:46 in Category 1b. This is particularly interesting since the question of whether women could act as (long-distance) traders was brought up in connection with the Bryggen inscriptions (see feminine idionyms on name-tags Liestøl & Johnsen 1980-1990). This observation, as well as the frankly astonishing number (a 50-50 split was certainly not the expected outcome) of predominantly Icelandic idionyms in such a (comparatively) small corpus raises an important question: can these idionyms be interpreted as confirmation for the presence of Icelandic traders in Bjǫrgvin? Manuscripts mention frequent presence of Icelanders and Hagland (1988a,b, 1989) interprets “names which are part of Icelandic naming customs” (Hagland 1989: 91, my translation) as evidence of Icelandic traders being physically present in the town. The possibility should not be discounted, although the presence of one’s name-tag need not imply physical presence of the owner as well. But can the categorisation of an idionym as being predominantly Icelandic actually support this conclusion? In light of the supposed workings of OWN naming customs, there is another possible interpretation: the runic inscriptions in question might have been carved by Norwegians from the non-manuscript-using parts of the population.

Why consider the possibility of the rune-carver being Norwegian, though? In my opinion, this alternative cannot be discounted for the simple reason that the part of the population reflected in the diplomataria is a distinct group of wealthy, land-owning men able to afford, and in need of, manuscript writing. It does not reflect the Norwegian population as a whole, so assuming it would provide reliable insights into the naming customs of the whole population would be jumping to conclusions. We do not know how widespread a custom like name transfer was or whether it was used across social strata. Even if it was, that some idionyms do not, or only infrequently, appear in the Norwegian, yet do appear in the Icelandic diplomas can also be explained by the settlement process. Many land-owning families left for Iceland during the 900s, bringing with them their names and customs. This would explain why certain idionyms, based on the source material available to us, appear to be predominantly Icelandic, when they could very well also have remained in use in Norway amongst those parts of the population not appearing in manuscripts.

Lacking knowledge about this part of the population, it is difficult to support this hypothesis by evidence. Considering the total tokens of predominantly Icelandic idionyms in the Bryggen inscriptions and their overall number (86 without potential invocations, 98 with) the total tokens of predominantly Norwegian idionyms (139 without, 147 with potential invocations), the gap between the two groups is certainly not large (Query C.7). Presupposing that the use of runes is restricted to the upper social echelons, it would be most logical to assume that the inscriptions are evidence of Icelandic traders of some social importance (and enough wealth to travel to Bjǫrgvin). Yet if runes were not exclusively used by the upper social echelons, then an explanation like the one presented above is equally plausible. If the latter is the case, the inscriptions may mirror the upper social classes and/or have been carved by just about anyone living in or visiting the town (see Chapter 7 for a discussion on the importance of the material for potential social status of rune-carver).

With the exception of foreign idionyms, very little work has been done on this aspect so far and therefore it remains an open question. Generally, an attempt could be made to determine the likelihood of each solution object by object, if not for the fact that very little information regarding the social status of the name-bearers can be gleaned from the objects themselves either (Chapter 7). Carefully interpreting the Category-1a-idionyms as signifying Icelandic ties and certainly in some cases actual presence of an Icelander, may be the best compromise, especially when taking into account that Icelandic ties might also be present in the form of a child of mixed background (Section 5.1.2). At this point in time, immigration can go either way between those two countries, so this is a valid possibility, not to mention a potential diaspora. Interpreting the supposedly predominantly Icelandic idionyms as signifying a person of the non-manuscript-using population in Bjǫrgvin carving runic inscriptions cannot be ruled out on the premise that absence of evidence cannot be considered evidence of absence, though. Not knowing how those not partaking in manuscript writing named their children does not imply that they followed different customs or used another set of idionyms.

Table 21 provides an overview of all Category-1a-idionyms sorted by quartile (Section 5.4; the number of idionyms does not fit with the respective quartile encompassing 25% of the corpus, because the quartiles have been calculated on *all* idionyms appearing in *DI*/*DN*. The missing ones belong to Category 2, Section 5.7.3). Some idionyms need to be excluded, since *Markús, Mat(t)heus* and *Thomás* only appear as *invocations* in the inscriptions.

The 51 idionyms in Category 1a distribute around the median 38:13, leading to the conclusion that the majority of idionyms in Category 1a are either commonly or often used in Iceland. The idionyms from the two groups above the median at the very least appear more frequently in *DI*; when one of them is found in the Bryggen material, it is therefore more likely to have belonged to an Icelander of high social status than those in the two groups below the median. This interpretation aligns well with prior interpretations of some idionyms, in particular *Gísl* and *Rúnolfr* (Liestøl & Johnsen 1980-1990: 167, 189). Interpreting those inscriptions as having been carved by, or at least referring to wealthy Icelanders appears reasonable. For other idionyms, the quartile does not align with prior interpretation, for example *Ragnarr,* which has traditionally been identified as belonging to a Norwegian (Liestøl & Johnsen 1980-1990: 187). This does not contradict the argument presented here, since the location of *Ragnarr* in the second quartile might indicate that one is looking at a Norwegian of low social status, whose name became more frequent in Iceland, but did not make it all the way to the top. That the idionym itself is part of the Icelandic group contradicts prior scholarship, though, insofar as *Ragnarr* is considered Norwegian by Lind (1905-1915: 838), and Kruken (2013) believe it to be borrowed from Denmark. The contradiction cannot be resolved without further research.

Strikingly, some idionyms considered typically Icelandic like *Eldjarn/Eldiárn* or *Þórhallr* (Liestøl & Johnsen 1980-1990: 159, 208) are still below the median. Apparently "typical" does not necessarily translate to "frequent", even if Johnsen comments that "After that time [when a Norwegian bearer of said name emigrated to Iceland during the 900s], it only appears in Iceland, where it becomes common" (my translation Liestøl & Johnsen 1980-1990: 208). Considering this, perhaps it might be appropriate in future research to distinguish between the terms "typical" and "common". An idionym can be "typical" for a certain subgroup of the population *if and when* it is *exclusively* used within that part of the population; it does not have to be carried by a significant proportion of said group as well to serve as an indicator that a single name-bearer is part of the group. Yet designating every idionym appearing only once as "typical" would take conclusions too far; the idionym needs to appear with reasonable frequency in one group opposed to not at all in control groups to justify labelling it as "typical". Still, high frequency is not enough to consider usage of a certain idionym indicative for a certain group.

Also interestingly, only one feminine idionym sorts into quartile 1, whereas *Vígdís, Sǫlveig, Þorbjǫrg* appear in quartile 3 and *Guðríðr, Yngvildr* in quartile 4. Does this support the idea of female Icelandic long-distance traders? Only *Anna* sorts into the same quartile in *DN*. *Vígdís, Sǫlveig* sort into quartile 1 in *DN* as opposed to 3 in *DI*, *Þorbjǫrg* into 2 instead of 3. The difference in quartiles is even more noticeable for *Yngvildr,* which sorts into

Quartile	Tokens	Idionyms	Total
1	≤ 8.25	Glúmr, Ími, Búi, Anna (f), Vémundr	5
2	≤ 24	Gunnstein, Ámundi, Didrik, Eldjarn/Eldiárn, Ragnarr, Mat(t)heus, Þórhallr, Þorbergr	8
3	≤ 61.75	Vígdís (f), Kárr, Brandr, Þorvaldr, Þorbjǫrg (f), Arni, Hálfdan, Gísl, Þorvarðr, Sǫlveig (f), Eyjolfr/Eyiólfr, Skeggi, Ljótr/Liotr	13
4	≤ 204	Guðríðr (f), Eindriði, Þorfinnr, Vilhelmus/Vilhiálmr, Þorlákr, Arnbjǫrn, Yngvildr (f), Bergþórr, Oddr, Finnr, Markús, Sighvatr, Þorgrímr, Thomás, Egill, Hákon, Benedikt, Illugi, Ingimundr, Ásgrímr, Kolbeinn, Rúnolfr, Erlendr, Ari, Narfi	25

Table 21. *Predominantly Icelandic idionyms sorted by quartiles, listed according to count of tokens, feminine idionyms marked with (f).*

Category	Bryggen/DI	Idionyms
I	DI	Ari, Ásgrímr, Hákon, Illugi, Ingimundr, Narfi, Rúnolfr, Thomás
I	B	Arni
N	B	Eiríkr, Eysteinn, Ívarr, Ólafr, Sigurðr, Þóraldi, Þórir
P	B	Án(n), Áni, Einarr, Gunnarr, Hallkatla, Ió(h)an/Jó(h)an, Lúcia, María, Sámr, Sigvaldr, Vígi, Þórr
	B	Anne, Auðr, Hermaðr

Table 22. *The 31 idionyms showing different distributions when comparing the Bryggen inscriptions to DI (second column), and how they sort into the categories based on the comparison of diplomataria. Categories are indicated by I(celand), N(orway), P(an-Scandinavian), nothing if the idionym only appears in the inscriptions (Query C.26).*

quartile 1 in *DN* as opposed to 4 in *DI*. *Guðríðr* shows less of a gap, being in 3 instead of 4 in *DN*. As far as the feminine idionyms are concerned, differences in use between both countries appear obvious. It is tempting to explain those differences in quartile positioning by regarding these name-bearers as Icelandic women visiting/being in Bjǫrgvin for some purpose. However, without studying a different sample of feminine idionyms, preferably one encompassing all feminine idionyms known from either country, there is no way of knowing whether the quartile distribution of the current sample can be considered representative for Iceland, or whether this observation is owed to the sample being prejudiced towards Norwegian customs. There is also the real possibility of these idionyms belonging to women from the lower social scales in Bjǫrgvin.

How do the patterns in the inscriptions and *DI* compare? To use χ^2-testing for comparison to the diplomataria, the 6 tokens for *Ió(h)an/Jó(h)an* and 9 of *Jón* from the Bryggen inscriptions were added up to 15, since they were subsumed under *Ió(h)an/Jó(h)an* in Lind (1905-1915, 1931). *Invocation*-marked tokens were discounted, although they may appear as interlocutor-idionyms in *DI*. The result indicates that the differences are not quite as great as those between the diplomataria, although still well below p<.01:

> Pearson's Chi-squared test with simulated p-value (based on 10000 replicates)
>
> X-squared = 2089.2, df = NA, p-value = 9.999e-05

H_0 can again be rejected; the two corpora differ either in distribution of idionyms or regarding the population behind the sample, the latter being the more likely explanation. Yet from the sample of 218 idionyms fulfilling the requirements (they appear at least once either in the inscriptions or *DI*), only 31 show p<.01. Patterns therefore differ only where these 31 idionyms are concerned, whereas for all other idionyms, H_0 cannot be rejected.

This result provides a first glimpse at a potential answer to the questions above; it suggests that the rune-carvers might have been named in accordance with naming customs also observed in Iceland (discussion of how the sample compares to *DN*, and by extension, Norwegian naming customs, follows in Section 5.7.2). This makes an interpretation of some inscriptions indicating Icelandic visitors in Bjǫrgvin more likely; at the same time, it becomes more difficult to decide whether for example the feminine idionyms might indicate Icelandic or local women. It also lends some credence to the shift described above – since so many idionyms show similar distribution patterns, their presence in *DI* might be due to some idionyms having gained more prevalence in Iceland after the settlement. It would at this point be interesting to know how many families from Vestlandet, in particular the areas around Bjǫrgvin, emigrated to Iceland, and what their names were.

With apparently greater similarities between these two corpora than differences, the 31 idionyms in the latter group are particularly interesting. Only eight show higher relative frequencies in *DI* than in the inscriptions, whereas 21 have higher frequencies in the Bryggen material (Query C.26, Table 22) and two, *Anne, Hermaðr* have *iceperc* IS NULL – since they do not appear in the diplomataria, it is safe to say that their relative frequencies are greater in the inscriptions. Eight idionyms belong to Category 1a: *Ari, Ásgrímr, Hákon, Illugi, Ingimundr, Narfi, Rúnolfr, Thomás.* Since they appear more often in *DI* than either the inscriptions or *DN*, the possibility of the men in question being Icelanders arises once more. Their high ranking in the quartiles suggests that they may indeed be Icelandic elite (except *Thomás,* which does not appear as a PN in the inscriptions).

Seven idionyms have higher relative frequencies in the Bryggen corpus and belong to Category 1b (Query C.26). In other words, regardless of the quartile in which they appear and considering their geographical find location, their name-bearers can be regarded as almost certainly Norwegian (page 118). This conclusion is further reinforced by the fact that with the exception of *Þóraldi,* which comes from quartile 2, they all sort into quartiles 3 or 4 in *DN* (Table 78). However, that does not mean they appear infrequently in *DI*. *Sigurðr* sorts into quartile 4 in Iceland as well, and *Eiríkr, Ívarr, Ólafr, Þóraldi* only sort one quartile lower in *DI* than they do for *DN*. While the χ^2-test marks them out as being predominantly Norwegian, this should be kept in mind; the probability that these idionyms were carried by Icelanders visiting Bjǫrgvin is much higher than, for example, *Eysteinn,* which sorts respectively into quartile 4 and 1 in *DN* and *DI*, or *Þórir* (3/1). Looking at the Category-1a-idionyms with higher relative frequencies in *DI*, this also applies to *Narfi* (4/4). *Hákon, Ingimundr, Thomás* show a gap of one quartile (*DI* 4/3 *DN*), while the quartiles for *Ari, Ásgrímr, Rúnolfr* are separated by the median (2/4) and *Illugi* is in *DI* 4 and *DN* 1.

Further complications arise when looking at the inscriptions and possible combinations of idionyms. *Narfi* only appears as a patronymic on INS549, potentially combined with *Þorgarðr,* which belongs to Category 1b and can be found in *DI* 1 or *DN* 2, favouring this particular name-bearer being Norwegian. However, should the proper normalisation be *Þorfinnr,* the evidence would be in favour of the man having been an Icelander considering that both idionyms sort into Category 1a. If the right normalisation is *Þorviðr,* either is equally possible since that *Þorviðr* does not sort into any group. Explanations for all versions can be provided. Þorfinnr Narfasonr is most likely Icelandic given the current evidence. Þorviðr Narfasonr/Þorgarðr Narfasonr could have been Icelandic or Norwegian – perhaps he had an Icelandic father? If that should be the case, this inscription would represent a child of mixed background. With three possible normalisations, it is impossible to decide. For another combination on the same object, Erlendr Birgisonr, there is little doubt about the correct normalisation; in this case, a Category-1a-given name is combined with a Category-1b-patronymic. Two results of Icelandic-Norwegian intermarriages? Or simply the outcome of different naming traditions within social groups in the same country?

These idionyms are the ones with a statistically significant difference between the inscriptions and *DI* as well. The same observations can also be made when looking at all 218 appearing in one or the other corpus: quartile placement is often so similar that it is difficult to accept the idionym is more prevalent in one country. Since the sample is likely strongly prejudiced towards Norwegian naming customs, idionyms sorting into the upper quartiles for *DI* at present might be pushed down once a larger, better balanced sample has been taken (there is a big gap between the two ranges, see Table 14). There is also a good chance that with a different, larger sample, new calculations might change individual idionyms' current country allocation. Lastly, since the inscriptions were found in Bergen, meaning Norway, there is by default a higher probability that whoever carved a rune-stick in town would have been Norwegian. In the end, doubts remain attached to the current categorisation. On the other hand, disregarding the χ^2-test results by arguing that the quartile placement for both corpora coincides or is not markedly different is hardly justifiable either, especially since the quartiles were calculated on different samples (page 95). The less-than-satisfying, but honest conclusion is that a caveat along the lines of "but the name-bearer could also be a Norwegian, potentially of low social status" always needs to be attached to the Category-1a-idionyms. Because of the test results, the idionyms shall still be considered predominantly Icelandic, and depending on their quartile positioning, high- or low-status. However, especially when distribution patterns do not differ between *DI* and the Bryggen material, regardless of the potential social status, there is a very good chance that when these idionyms are encountered in inscriptions, they were carried by a local – even when they sort into a high quartile in *DI*.

Interpretation is somewhat less difficult for those idionyms in Category 1a sorting into the lower two quartiles, like *Eldjarn/Eldiárn,* which are not in frequent use amongst the Icelandic population, at least not the manuscript-using part of it. Since the non-manuscript writing part of the population might not have had the means to afford trade with or travel to Bjǫrgvin, it is also less likely that these inscriptions were carved by less wealthy Icelanders. They could, of course, have come to Bjǫrgvin as part of a ship's crew as suggested by Liestøl (1964a). Nevertheless, considering them as potential indications of a Norwegian of low social status is feasible, although again, the caveat of "it could still be an Icelander" has to be attached.

The only idionyms which could be considered reasonably reliable markers of social status and geographic origin alike are *Ari, Ásgrímr, Illugi, Rúnolfr*. That their distribution in Icelandic manuscripts when compared to the inscriptions indicates a greater use in Iceland, adds to the evidence that when they appear, there is a fair chance they signify Icelandic ties. Combined with the fact that *Ari* appears only twice in the Bryggen material, all other idionyms only once, if they were used by the non-manuscript-using, but rune-carving population of Norway, then they were probably used sparsely in that part of the population as well, unless the manuscript-using and rune-carving population consists of roughly the same group. For these four idionyms, Icelandic origin in addition to high social status of name-bearer appears to be the best-fitting conclusion. *Hákon, Ingimundr, Narfi,* due to their quartile positioning, have a greater caveat attached, and since *Thomás* does not appear as a PN, the question is moot.

One Category-1a-idionym appears in the other group, though: *Arni,* while supposedly predominantly used in Iceland, is apparently even more common in Bjǫrgvin. The current evidence favours interpreting this particular idionym as signifying local or long-distance traders. Its positioning in quartile 3 in *DI* indicates that the name-bearers possibly held a comparatively high social status. It sorts into Category 1a and when testing *DN* against the Bryggen material, the χ^2-test shows a statistically significant difference favouring Bryggen. Since *Arni* also appears twice in the English custom accounts (Sørlie 1950: 10), which record traders coming to the ports in Lynn, Boston, Hull, Scarborough and Ravenser (Sørlie 1950: 3), a case might be made that *Arni* might have been in use in traders' families, who could certainly acquire enough wealth over time to also afford manuscript writing, but perhaps more so in Iceland than in Norway. The acquisition of wealth and rise in social status of merchant families is certainly a trend observable across all of Europe during the time (Fuhrmann 2014: 174-177, 212-223). Since most of the inscription tokens come from name-tags, which were likely used in trading activities, this seems to be a feasible conclusion. Their number could then be ascribed to it being one of the major trading harbours for Icelandic traders.

Concluding this survey, the two corpora are more alike, and where there is a difference in distribution, the patterns generally favour the name-bearers being Norwegian rather than Icelandic, although considering the quartile positioning, this cannot be entirely discounted either for those idionyms appearing in the upper quartiles in *DI*.

The 42 idionyms in Category 1a showing no statistically significant deviation when compared to the inscriptions, but still considered predominantly Icelandic remain. They, too, are designated according to the test results as IL (Icelandic low-status) or IH (Icelandic high-status) with the caveats discussed here attached, even *Narfi,* which illustrates why and where studies such as this reach their limit when applied to closely related cultures. Interpretation of this group is even more difficult. Especially idionyms sorting into the lower two quartiles could, again, be considered evidence that rune-carving and -writing was by no means restricted to the upper social echelons in Bjǫrgvin. They could, however, also be interpreted as evidence that families were able to protect "their" idionyms and that Icelandic name customs differ from Norwegian ones because people from lower social scales rose in importance in Iceland. Another possible interpretation is that Bjǫrgvin was much more of a melting pot than previously assumed, at least where the Icelandic/Norwegian population was concerned – which, considering that a lot of these inscriptions can be interpreted as owner's tags, therefore related to trading activities, is not unlikely. With little knowledge of how families might be able to protect "their" idionyms, the first and last option appear the most likely, depending on where in the quartiles the respective idionym sorts. It is more likely that wealthy Icelanders would undertake the journey to Bjǫrgvin, therefore it is also more likely that these idionyms could have belonged to an Icelandic visitor. With 17 idionyms in quartile 4 in this group and 12 in quartile 3 (Table 78), they make up a substantial number, opposed to 8 idionyms in quartile 2 and 5 in quartile 1. The caveats still apply, especially where quartile placement is very similar at present; still, against the backdrop of Bjǫrgvin being such an important harbour for Icelanders, some of these idionyms were probably carried by Icelanders, potentially Icelanders who visited Bjǫrgvin frequently.

5.7.2 *Predominantly Norwegian idionyms*

The Category-1b-idionyms, as well, were split into quartiles. Astonishingly, none sort into quartile 1, and 2 does not encompass many either. Table 23 shows that most idionyms in Category 1b are also located above the median, with the majority etymologically Scandinavian. Several recall either royal personages (*Eiríkr, Erlingr, Haraldr, Ólafr*) or heroes from the Poetic Edda, the eponymous *Helgi Hundingsbani,* half-brother to the potentially most famous Nordic hero, *Sigurðr,* the Dragonslayer. The presence of the latter idionym in the uppermost quartile is no surprise at all given how popular the *Sigurðr*-character appears to have been in general in Scandinavia (Gunnes 1983: 155; Nordanskog 2006: 231-262), nor is it surprising that it also appears in quartile 4 in *DI*.

Category-1b-idionyms reference *Þórr* in their first theme, too. Out of 26 dithematic idionyms, 10 belong to Category 1b. Category 1a has eight which appear to distribute across the quartiles in approximately the same fashion (Table 21). Although in different variations, these idionyms were apparently common in both countries (cf. Gunnes 1983: 155).

A χ^2-test comparing the inscriptions and *DN*-samples was run, resulting in an overall χ-value of 6042.4 and a p-value of 0.00009999 (C.24). The following χ^2-test revealed that for 21 of 220 idionyms, H_0 cannot be rejected. This chimes in with the result of the comparison between *DI* and the Bryggen material, where H_0 could only be rejected for 31 idionyms; the similarities however appear to be greater between *DN* and Bryggen. 16 idionyms favour Bryggen (although three do not appear in the diplomataria), whereas five appear more often in *DN*. The idionyms sorting into Category 2 are discussed in Section 5.7.3.

Quartile	Tokens	Idionyms	Total
1	≤ 23.75		0
2	≤ 134	Arnbjǫrg (f), Fólkvarðr, Þorgarðr, Þóraldi, Ótto, Bergsveinn, Smiðr, Ǫlvir/Ølvir	8
3	≤ 308.25	Helga (f), Birgir, Jórunn/Iórunn (f), Þorgeirr, Þórir, Ása (f), Þorbjǫrn, Bárðr, Guðrún (f), Loðinn, Lafranz, Helgi, Ívarr, Þorkell, Karl	15
4	≤ 1435	Eysteinn, Klémetr, Gyrðr, Oddr, Þorsteinn, Þóraldr, Þórðr, Ólafr, Halldórr, Pétr, Þorgils/Þorgísl, Þólfr, Steinarr, Hrólfr (Rolfr), Bótolfr, Kolbjǫrn, Símon, Eiríkr, Nikulás/Nikolás, Haraldr, Eyvindr, Ǫgmundr, Ǫnundr, Hallvarðr, Hávarðr, Auðun, Áslákr, Sigurðr, Erlingr	28

Table 23. *Predominantly Norwegian idionyms sorted by quartiles, listed according to count of tokens, feminine idionyms marked with (f).*

Category	Bryggen/DN	Idionyms
I	B	Arni, Eldjarn/Eldiárn, Þórhallr
N	DN	Áslákr, Auðun, Erlingr, Hávarðr, Ǫnundr
N	B	Þórir
P	B	Áni, Gunnarr, Hallkatla, Ió(h)an/Jó(h)an, María, Sámr, Vígi, Þorkatla
	B	Anne, Auðr, Hermaðr, Sørkviðr

Table 24. *The 21 idionyms showing different distributions when comparing the Bryggen material to DN (second column), and how they sort into the categories based on the comparison of diplomataria. Categories are indicated by I(celand), N(orway), P(an-Scandinavian), nothing if the idionym only appears in the inscriptions (Query C.26).*

12 idionyms from Table 22 reappear in Table 24, but only one also falls into Category 1b: *Þórir.* It sorts into Quartile 3 in Category 1b. However, when *DN* and the inscriptions are compared, the latter shows the higher frequency. This could be interpreted as *Þórir* being a high-status idionym in Norway, whose bearers in Bjǫrgvin somewhat frequently used runes as a medium of communication, or that the idionym was used amongst both the manuscript-using and the rune-writing parts of the population. Interestingly, *Þórir* does not appear in either *Sverris saga* or *Hákonar saga* according to the lists compiled by Johannessen (2002), yet appears in the custom accounts (Sørlie 1950: 14). This could be considered as evidence for *Þórir* being used by moderately high-social status merchants. Alternatively, since the Bryggen/*DN*-comparison implies it was more commonly used in Bjǫrgvin and *Þórr*-idionyms are very popular in both countries, the name-bearers could also have been men of lower social status who shared this particular idionym with men higher up the social ladder.

Five other idionyms also point towards Norwegian men of potentially higher social status appearing as rune-carvers in Bjǫrgvin: *Áslákr, Auðun, Erlingr, Hávarðr, Ǫnundr.* They appear in quartile 4, so they are very common in Norwegian diplomas; yet in the Bryggen material, they appear once or twice (*Erlingr*). Since about $\frac{2}{3}$ of the idionyms only have one token from inscriptions, this need not mean anything, although considering the other idionyms known to have been carried by literary figures or men of high social status (page 116), it does not seem to be an isolated occurrence, either. Still, *Áslákr* and *Erlingr* appear in *Hákonar saga* (Johannessen 2002, 5 and 7 tokens) and the custom accounts (3 and 1 tokens), and *Ǫnundr* also appears in the custom accounts (1 token). They do, however, not appear in Johannessen's list of the most popular idionyms in *Sverris saga*. Although he counts by individual instead of occurrence and only lists the most popular 18 idionyms from *Sverris saga*, 32 from *Hákonar saga*, this is curious. Considering their placement within the quartiles (*Erlingr* ranks first, *Áslákr* third), it seems strange that they do not make the list in *Sverris saga*, especially since Sverrir's enemy was named Erlingr skakki. Equally difficult to explain is the lack of *Áslákr* unless one assumes that the idionym rapidly gained popularity after the Civil Wars to account for the exceptionally high count of tokens. While this goes beyond the scope of the current study, it would be very interesting to examine whether *Áslákr* might have been an idionym favoured by families with mercantile interests, and its increasing presence in manuscripts mirrors their growing wealth, which in turn enabled them to acquire land and take part in the kind of transactions often attested in diplomas (Buttinger 2012: 120; Johnsen 1987: 717).

Whatever the reason behind the saga distributions, as far as high-status idionyms in the Bryggen material are concerned, *Erlingr* and *Áslákr* are counted amongst them due to their placement in Quartile 4. Since *DN* shows higher frequencies and patterns diverge for *DI*, the men in the runic inscriptions potentially belong to the Norwegian elite occasionally making use of runes. Icelanders made less use of either idionym, which could explain why they turn up equally infrequently in the inscriptions and *DI*. Similar reasoning can be applied to *Auðun, Hávarðr, Ǫnundr* since they can be found in place four, five and six after *Áslákr* and thus, very much at the top of the ranking as well, although *Auðun* also sorts intó quartile 4 in Iceland.

Seven more idionyms from Table 22 need to be discussed at this point: *Eiríkr, Eysteinn, Ívarr, Ólafr, Sigurðr, Þóraldi, Þórir*. Their distribution in *DI* and Bryggen differs in favour of Bjǫrgvin, but all of them sort into Category 1b. Comparing the Bryggen material and *DN*, H_0 could not be rejected, except for *Þórir* (page 117). That they favour Bryggen in a comparison is no surprise, considering they sort into Category 1b. That they show the same distribution in *DN* as in the inscriptions can, where they sort into the upper quartiles (all except *Þóraldi*, quartile 2), be interpreted as Norwegian men of high social status making use of runes. Still, as with the Category-1a-idionyms, there is a caveat: they could have been popular across the whole population, as is probably the case for *Ólafr*; none of these idionyms appears less than three times in the Bryggen material (page 116, Table 77). There is a chance that when they appear in runic inscriptions, they designate men of comparatively high social status, but they could also represent men of lower social status carrying very common idionyms.

The opposite is the case for the last two idionyms: *Eldjarn/Eldiárn, Þórhallr.* Like *Arni* (page 115), they sort into Category 1a, but favour Bryggen over *DN*. Neither is particularly common in *DI*, however (Table 21), and *Þórhallr* has only two tokens from the inscriptions, *Eldjarn/Eldiárn* one. Interpretation is tricky; since H_0 cannot be rejected for the *DI*/Bryggen-comparison, but either idionym is still more common in the Bryggen material than in *DN*, are those two/three individuals low-status Icelanders visiting Bjǫrgvin, low-status medieval Bergensere or fairly high-ranking Icelanders carrying a rare idionym? In the end, the available evidence allows no final conclusion, especially since low-status Icelanders could, for example, have been hired sailors and reached Bjǫrgvin that way; they need not have been merchants themselves.

For Category 1b, the question is less one of geographic origin and more one of how common certain idionyms would have been amongst the population in general, not just the manuscript-using group. As with the Category-1a-idionyms, Category-1b-idionyms will be labelled NH (Norwegian high-status) or NL (Norwegian low-status) according to their quartile positioning, with caveats applying. One caveat, illustrated by *Eldjarn/Eldiárn, Þórhallr*, is that idionyms in the lower two quartiles could just have been used sparingly even within those families "owning" them, thus resulting in a low number of tokens. The other caveat concerns the spread of popular idionyms across the population, although the probability of the name-bearer in question being of fairly high social status is higher if the idionym sorts into the upper quartiles.

This brings the discussion to the so far ignored foreign idionyms. The presence of etymologically non-Scandinavian idionyms in the third or fourth quartile either in *DI* or *DN* raises the question of why they are there. In the lower quartiles (*Fólkvarðr, Ótto*), an explanation can be found in correspondence or occasional business dealings with foreigners, but that can hardly be the explanation for idionyms occurring in the upper quartiles. This subgroup consists of idionyms either of Hebrew, Aramaic, Latin, Greek or common-Germanic origin (*origin*-column, IDIONYM, based on Kruken 2013). One explanation may be that all of these idionyms are inspired by the Christian religion, either because they occur in the Bible, or because they are the names of saints or (wo)men otherwise connected to Christianity (cf. the story of the first use of *Magnús* in Norway in *Ólafs saga helga*, Johannessen 2002: 30). The adoption of Christianity-associated idionyms in medieval Scandinavia has been the topic of much research (for example Gunnes 1983; Meldgaard 1994; Johannessen 2002) and shall therefore not be gone into in detail; one hypothesis is that Christianity-inspired idionyms were first used in royal families for female children as well as younger and illegitimate sons (Meldgaard 1994: 207). In Norway, however, the adoption of Christianity-inspired masculine idionyms does not start with the royal families (Johannessen 2002: 31, 52).

The expectation was that Category 1b would include more foreign idionyms than Category 1a, but in fact, they differ only by one. Instead, 39 sort into Category 2, pan-Scandinavian idionyms, while Category 1a only contains seven, Category 1b eight (Table 77). In all categories, they distribute across all quartiles without discernible trends, which makes it difficult to draw conclusions on a larger scale. Additionally, the speed with which these foreign idionyms spread amongst the population has to be taken into account. *Lafranz* and *Nikulás/Nikolás,* for example, are considered amongst the first international saint idionyms being used in Norway (Halvorsen 1975: 158), yet they might only have come into frequent use in later years (Gunnes 1983: 161). In the inscriptions, they appear once and twice, respectively, once each in an invocation, and they sort into Category 1b (quartile 4 *DN*, 3 *DI*, *Nikulás/Nikolás*; *DN* 3, *DI* 1, *Lafranz*). But with regard to their potential social status at the time of the rune-carvers, very little can be said. It certainly is unlikely that by coincidence, a lot of men whose social status would not normally necessitate mention in a manuscript, would just so happen to be mentioned in the diplomas. Yet should all of the imported idionyms, regardless of their quartile placement, be considered as high-status indicators based on the hypothesis that the rich families were responsible for their import? How important is, in this specific case, the time dimension?

Since it was impossible to date every single diploma and it is therefore also not possible to pinpoint when exactly these idionyms start becoming more common amongst the manuscript-using group, could foreign idionyms in the lower quartiles represent early imports, subsequently abandoned in favour of others? And most importantly: how frequent were these idionyms amongst people who generally do *not* appear in manuscripts, but who might use runes?

Again, the lack of a control group of idionyms clearly borne by people from the lower social scales restricts further interpretation. It is simply not possible to decide whether the sudden preference for certain Christianity-inspired idionyms encompassed the whole population or only parts of it or how exclusive these idionyms were. Very simply put, the whole premise of this study only works if families were able to "protect" their distinctive idionyms against being appropriated by people from other, unrelated families, which in turn would lead to those being underrepresented in the diplomataria. The newly imported idionyms, however, might have proven much more difficult to appropriate and protect, not least because Biblical stories were becoming commonly known. Additionally, Bjǫrgvin was a town and changes in naming customs in Norway took longer in the rural areas than in towns (Meldgaard 1994: 210-211). It is therefore entirely possible that the corpus based on the inscriptions, in which borrowed idionyms appear quite frequently, is indicative of naming customs changing amongst the lower social scales in Bjǫrgvin, keeping step with the changes in higher social circles due to the closer proximity and the less traditional setting of the newly-established town. For inscriptions showing foreign idionyms, the potential explanation can therefore include

- person of high social status named in accordance with a new trend, using both manuscripts and runes;
- person of low social status named in accordance with a new trend, capable of using runes;
- child of mixed background, of high or low social status;
- non-Scandinavian, either capable of using runes or appearing in runic inscriptions owing to dealings with the local rune-carving population.

Although previous scholars lean toward one or the other explanation (for example Sørlie 1950: 9), I prefer excluding the whole group of etymologically non-Scandinavian idionyms from any analysis regarding the social background of name-bearers for the moment, since I believe more research is needed before conclusive statements can be made, especially concerning the time-frame. This excludes several idionyms from analysis, but if this survey has shown anything so far, it is that the results are far from conclusive for most idionyms, and sampling difficulties render what few conclusions can be drawn preliminary as well. Still, they also show that using χ^2-testing and quartiles on this corpus can expose certain tendencies in the onomastic material, including previously debated questions about the geographic origin of name-bearers. Two groups remain.

5.7.3 Idionyms in equal use in both diplomataria

80 idionyms belong to Category 2, where H_0 cannot be rejected (Table 77). As in Category 1, the two lower quartiles do not contain many idionyms, because quartiles are calculated on the basis of *DN/DI* and 54 idionyms sort into different quartiles in the two corpora (Table 78). These are excluded from analysis.

For 26 idionyms, the quartile placement aligns (Table 25). They appear to hold the same social status across the corpora and have been designated as PSL (pan-Scandinavian low-status) and PSH (pan-Scandinavian high-status) respectively. Idionyms only appearing as invocations in the Bryggen material from this category are *Andreas/Andrés, Elisabet(h), Gabriel, Lukas, Michael/Mikiáll, Óðinn*. Potentially *María* also belongs to this group, but for two inscriptions, the scholar is not clear on whether these are considered invocations; they are therefore included (see page 78 about *María*'s status as a taboo name). For 23 idionyms, patterns between all three corpora and quartiles coincide:

- Quartile 1: *Hallbjǫrg* (f), *Kormakr, Lukas, Vébrandr*
- Quartile 2: *Halli, Hermann, Styrkárr*
- Quartile 3: *Andreas/Andrés, Bjǫrn/Biǫrn, Hallkell, Heinrekr, Ingiríðr* (f), *Ingjaldr/Ingialdr, Magnús*
- Quartile 4: *Arnfinnr, Ásmundr, Guðmundr, Guðþormr, Ingibjǫrg/Ingibiǫrg* (f), *Margrét(a)* (f), *Sigríðr* (f), *Þorleifr, Þormóðr*

It is likely no coincidence that this list is almost the same as Table 25. Placing these idionyms geographically is not possible, but it is interesting that most of them cluster in the upper two quartiles. They appear to be fairly common amongst the manuscript-using population in Norway and Iceland as well as the rune-carvers in Bjǫrgvin. Since their patterns correspond in all corpora, though, it is again difficult to say whether the rune-carvers were men/women of high social status or the idionyms are generally popular. Both possibilities should therefore be considered as valid interpretations, while the ones in the lower quartiles might be ascribed to name-bearers of a lower social status – perhaps especially since their distribution does not differ between the three corpora. Again, merchants located somewhere in the middle of the societal order come to mind as potential name-bearers.

Noteworthy is that of five feminine idionyms in this group, four sort above the median, *Ingiríðr (f), Ingibjǫrg/Ingibiǫrg, Margrét(a), Sigríðr*. This is unusual for feminine idionyms on the whole owing to the skewed gender balance in the source material; the number of name-bearers (or their correspondence) must have been staggering for so many tokens to appear in the diplomataria. This leaves two possible conclusions: either the Bjǫrgvin name-bearers were women of high social status or these idionyms were extremely common amongst the population in either country as a whole, low- and high-status groups included. This is a question

Quartile	Idionyms	Total
1	Hallbjǫrg (f), Kormakr, Lukas, Vébrandr, Þorkatla (f)	5
2	Einarr, Halli, Hermann, Styrkárr	4
3	Andreas/Andrés, Bjǫrn/Biǫrn, Hallkell, Heinrekr, Ingiríðr (f), Ingjaldr/Ingialdr, Ió(h)an/Jó(h)an, Magnús	8
4	Arnfinnr, Ásmundr, Guðmundr, Guðþormr, Ingibjǫrg/Ingibiǫrg (f), Margrét(a) (f), Sigríðr (f), Þorleifr, Þormóðr	9

Table 25. *Idionyms in equal use in both diplomataria and within the same quartiles in DI and DN; feminine idionyms are marked with (f).*

that can only be answered on the basis of more evidence (Chapter 7).

There are two more possibilities for combination of results for this group: Bryggen can either have a higher or lower relative frequency than both manuscript corpora. Quartiles distribution needs to coincide so the potential social status can be determined. There is no idionym in Category 2 where Bryggen has lower relative frequencies than both *DI* and *DN*, but for *Ió(h)an/Jó(h)an*, Bryggen shows higher relative frequencies – technically at least, since all tokens of *Jón* were added to those of *Ió(h)an/Jó(h)an*. It seems that regardless of variation, different versions of *Johannes* appeared frequently in Bjǫrgvin. With a quartile 3-placement, the result supports Johannessen (2002: 42) in that *Jón* has become very popular amongst those of higher social status. How variations fare by themselves is more difficult to gauge without having counted up the tokens for each. Conclusive statements regarding the higher relative frequency in Bryggen therefore remain difficult, other than that it could, once more, hint at men of comparatively high social status having a, perhaps mercantile, interest in Bjǫrgvin.

Category 2 yields a surprisingly low number of idionyms where results can be used for drawing conclusions, especially considering that two of the corpora tested against each other come from the same country and that naming customs based on the samples from *DI* and *DN* are more alike than divergent. However, the main reason behind many of the idionyms having to be discarded for analysis is their contradictory quartile placement. This problem does not present itself with the last group of idionyms.

5.7.4 Idionyms absent in the diplomataria

This group consists of 47 (48 including *Jón*) idionyms which have so far not been observed in the diplomataria or were even unknown before the Bryggen inscriptions (Section 5.3.4). A variety of idionyms also belonging to this category were dismissed at once (*Abed-Nego, Amor, Constantinus, Dionysius, Jesus, Malchus, Martinianus, Maximianus, Mesak, Philomena, Raphael, Sadrak, Serapion, Tereus, Yggjar/Yggr*), since they are clearly not being used as personal names. In some cases, this is obvious even without the inscription context (*Jesus*), while in other cases, the question can only be answered by looking at the inscription context (for example *Grímnir, Yggjar/Yggr, Hafdjarfr;* see also Section 5.6). The remaining group is varied: *Alfvardr, Klas, Poppe* can probably be ascribed to visitors from countries like Germany or the Netherlands (Markali 1983), *Bótleifr* probably originates from the Swedish island of Gotland (for example Johnsen 1981; Markali 1983) and *Lunaney* may have had Irish connections or even ancestry (Liestøl & Johnsen 1980-1990: 108-110).

Several idionyms were encountered the first time in the Bryggen material and are difficult to even identify as a proper given name, like *Búr-Almarr*. The vast majority of them is etymologically Scandinavian though; following the approach established in Section 5.1.3, the name-bearers are consequently considered Scandinavians. Some, like *Tonna,* may have been of Swedish origin (Markali 1983), but as this study shows, it is difficult to say that with certainty based on only manuscript-written sources,

Normalised	Inscription(s)	Token(s)
Agnbjǫrg (f)	1	1
Alfvardr	1	1
Anne (f)	3	3
Auðmundr	1	1
Auðr (mf)	2	2
Bergþóra (f)	1	1
Bótleifr	1	1
Búr-Almarr	1	1
Einri	1	1
Gusir	1	1
Hallgísl/Hallgils	1	1
Herikr	1	1
Jón	7	9
Klas	1	1
Lunaney (f)	1	1
Ormríkr	1	1
Poppe	1	1
Reiðarr	1	1
Sægunni	1	1
Sigbaldr	1	1
Sigvaldi	1	1
Sørkviðr	1	1
Sverðolfr	1	1
Tonna (f)	1	1
Þiðrikr	1	1
Þjóðarr	1	1
Þóri	1	1

Table 26. *Idionyms from Category 3, not found in either diplomatarium. The list includes* Jón*, although technically this idionym is listed in Lind (1905-1915, 1931) under* Ió(h)an *(page 108). "Inscription(s)" gives the number of how many inscriptions contain the idionym at most, while "Token(s)" shows how often an idionym has been identified at most in the whole corpus. In cases where they do not coincide, the same idionym can be found twice in one inscription (Section 5.5; Query C.27).*

since they represent a very particular sample of the population. With these idionyms absent in the diplomataria, very little can be said about the social status they indicate, although an argument could be made that since they do not appear in the diplomataria, they are not likely to be used by the upper echelons of society. However, the argument can also be made that the idionym in question does belong to a person of high social status, but that it is rare even in this peer group, and therefore was not preserved in the diplomataria. Two examples illustrate the problem.

Auðr is known as a feminine idionym (although it represents one of the rare cases that can be used for either gender) from sagas and historical sources, with two carriers being princesses and/or kings' wives and one a settler in Iceland. Another Auðr is wife to the eponymous hero of Gísla saga, who despite his being outlawed, stays loyal and even fights to protect him. An idionym connected so strongly with virtues and royalty could gain quite some popularity amongst the population, yet it lists zero tokens in either diplomatarium. Women named *Auðr* did apparently not contribute enough written material to have even one document survive, either because the idionym was not all that common amongst the upper social scales after all, or because it was common amongst those not participating in manuscript writing. That it turns up twice in the inscriptions is therefore quite interesting.

Almost the same applies to *Bergþóra*. She is wife to Njál from Brennu-Njáls saga, also considered a good wife, although her retaliation for the actions of Hallgerðr, wife to Njál's friend Gunnarr, greatly helps the plot along by furthering the rift between the two families. Again, one might think that this idionym might turn up more often in manuscript sources, yet it, too, has zero tokens in the diplomataria. Considering these two idionyms as high social status indicators based on the sagas would therefore completely ignore contradictory evidence in the form of diplomataria tokens. It appears more feasible to exclude these idionyms from the present study along with the other non-status associated idionyms from this group.

5.7.5 Feminine idionyms

Feminine idionyms on the whole present greater difficulties for interpretation than masculine ones, since the imbalance between tokens of feminine and masculine idionyms results in most of the feminine idionyms likely being sorted into a quartile not mirroring their proper social status (page 85). Calculating new quartiles on the basis of tokens only for feminine idionyms is no solution either – the sample is prejudiced by idionyms appearing in the inscriptions and therefore comprises too few and random feminine idionyms. The issues inherent in this mismatch were discussed already (pages 112 and 120), so a short summary must suffice. The ratio of feminine to masculine idionyms in Categories 1a and b is almost the same (6:45 and 5:46, Tables 21 and 23), so Category 1a does not contain fewer feminine idionyms, which could be interpreted as an argument against women being long-distance traders. Additionally, three of the idionyms in question sort into a considerably lower quartile in *DN* than they do in *DI*; then again, the count of tokens also varies significantly between the two corpora (Table 14) and said feminine idionyms would sort into a much lower quartile as well if the *DI*-tokens were similarly numerous.

None of the six, respectively five, feminine idionyms from Category 1a and b show different distributions when compared to the Bryggen material either (Tables 22 and 24). Instead, the feminine idionyms which differ in distribution (all in favour of Bryggen) are *Anne, Hallkatla, María, Lúcia, Þorkatla*, found either in Category 2 or 3 (Section 5.7.4). Category 2 contains 39 feminine idionyms in total (Table 77), but not necessarily in the same quartiles, so again, they cannot be used for analysis. Additionally, arguing that women must be from Iceland, when it is equally likely that they were from Norway, is difficult. As far as the feminine idionyms from Category 1a are concerned, the possibility that these were Icelandic women, potentially involved in trading activities, must at least be considered seriously. Those in Category 1b, on the contrary, point towards local women, whereas those from Category 3 could be Icelandic, but considering where the inscriptions were found, the probability for them having been Norwegian is higher.

This raises another important question, whether the social status of these women can be determined on the current evidence. It is easier to answer for those feminine idionyms sorting into the upper two quartiles, because the sheer number of tokens raises the likelihood for women of high social status to have carved or be mentioned in a runic inscription (page 120). Yet there is also a greater likelihood that these particular idionyms were simply extremely common. Concerning feminine idionyms in the lower two quartiles and those absent from the diplomataria (Section 5.7.4), I would argue that the skewed gender balance needs to be taken into account in these cases. Feminine idionyms sorting into the lower two quartiles cannot be considered as low-status by default, regardless of potential country location, in the same way that masculine ones can be. Instead, the same caveat already introduced before for idionyms below the median is applicable in a slightly altered fashion: there is always the possibility that the idionym is indicative of a woman of high social status, but imbalances in the samples prevents us from recognising it as such. This applies to a certain extent also to the feminine idionyms sorting into Category 3. The fact that they do not appear in the diplomataria makes their social status incredibly difficult to judge, as illustrated on page 122.

5.8 Names as markers of social status and runic literacy

To conclude this survey of the idionyms appearing in the runic inscriptions from Bryggen, given the nature of the sample, its likely prejudice towards Norway and the lack of knowledge about the social background of the diplomataria name-bearers, even the conclusions drawn remain preliminary and tentative and have caveats attached. The discussion shows the main reservation against this approach, the question of whether idionyms are even all that indicative of social status or can be used in such a way without a control group mirroring the part of the population that does not appear in diplomas. If idionyms are not as indicative of social status as this survey assumes, do current scholarly hypotheses about naming customs even mirror real-life circumstances in Scandinavia at the time all that well?

Other factors play into this, not least whether families were able to protect “their” idionyms or if only a few families managed to monopolise very few idionyms. In this study, these idionyms would then be interpreted as low-status, although they might have belonged to those with the highest social status. Conversely, all idionyms identified as “high-status” can equally have been used by the lower social scales of society, in other words, may have been so common that they do not really indicate high social status after all. Too little is known in particular about the adoption of Christianity-inspired idionyms both among the higher and lower social scales.

Time and other constraints also prevented working out which tokens might have belonged to the same individual. It is close to impossible to determine whether two runic inscriptions refer to one or two individuals of the same name, as is determining whether or not two idionyms on one and the same rune-stick belonged to more than one person, although in that case, probability and known customs suggest two different name-bearers. With the diplomataria, one might be more successful, for they often offer more information about the individuals than just their idionyms. If approached in the proper fashion, it might even to some extent be possible to establish family trees based on the diplomataria material, which in turn would enable scholars to trace idionyms through these. A study of OWN family trees and cases of name transfer in these would provide a useful counterpoint to this study. In short, more studies and numbers are required, for example the possibility to trace name usage according to dating of diplomas and more insight into the background of the men and women mentioned in the diplomas and their social status.

With the lack of comparative corpora and the complications regarding frequency of name usage, all observations, but especially those concerning the social status of an idionym, should therefore be taken as at most signifying tendencies in the material. Apart from the complications introduced by the lack of comparable studies and application of statistical measures, name usage in Scandinavia might have been a lot more flexible than was assumed for the purposes of this study.

Considering these objections, using the results to make statements about the rune-carving abilities of the broader population of Bjǫrgvin are risky as well. However, this survey was not conducted with a view to presenting a final conclusion, rather as an experiment testing the limitations of using a RDBMS for the purpose (Section 5.7.1). As such, it is to be expected that the results presented here will change when the sample size is increased/decreased or when a different test is applied, which would offer the opportunity of independently verifying or dismissing the results for single idionyms or the whole corpus. On the understanding that these issues exist and more research is needed, a few concluding words on runic literacy in Bjǫrgvin on the basis of the rune-carvers’ names can be offered. That 51 idionyms showing higher relative frequencies in *DI* appear in the Bryggen material supports the hypothesis that Icelanders likely used runes in Bjǫrgvin, potentially in connection with trade. The men and women carrying the Category-1a-idionyms may have lived in Bjǫrgvin or may have been visiting; without a doubt migration was a factor, but so is common usage of certain idionyms across the whole population and in Norway and Iceland. The Category-1a-idionyms can therefore not be taken as certain indicators for geographic origin; each case needs to be judged by itself. Pan-Scandinavian high-status idionyms from quartiles 3 and 4, which either distribute equally in the Bryggen material or are prevalent in the diplomataria could theoretically have been carved by Icelanders, too, although they as well might have been carved by Norwegian locals lower on the social scale. Bjǫrgvin was still a Norwegian town, so even if the χ^2-test results currently indicate that naming customs went in different directions in Iceland and Norway, probably right after the initial settlement period, there are still strong similarities. When distribution patterns differ between one of the diplomataria corpora and Bryggen, they often favour the diplomatarium in question, indicating that the idionyms appear more frequently in the diplomas, which could suggest that those name-bearers are from the parts of society appearing in diplomas. The 28 idionyms used as PNs in Category 3, in turn, could be taken to indicate people of lower social status using runes on occasion. Yet most of these only appear one time in the inscriptions, so it remains to be determined whether that can be ascribed to the relative rarity of the idionym or their bearers simply not making use of runes frequently.

Without arguing that runes and rune-carving were activities *restricted* to the upper echelons of society in Bjǫrgvin, there are certainly indications that men and women from the upper social scales at least *engaged* in rune-carving, and that people from the lower social scales did so as well. In short, it was probably an activity not restricted to a specific social group, something the nature of the objects also suggests, as they are often everyday items. This supports the hypothesis that the inscriptions indeed provide written evidence from a part of the population usually not attested in writing; whether this part of the population might have been merchants is a question that remains to be answered. How the names relate to the objects they are carved into will be discussed in Chapter 7; the next section focuses on the actual content of the inscriptions.

6 Qualitative text analysis: runic literacy and usage at different levels of society

While the analyses in the previous chapter aimed to investigate the rune-carver's potential social status by means of their idionyms, this chapter focuses on what they had to communicate and how this affects conclusions about the rune-cavers' potential social status. In this context, Liestøl (1974: 21) speaks of the "language of things" and how runic inscriptions, by virtue of relaying textual information, can help to expand knowledge and provide insights into areas of daily life that do not generally leave material traces. As texts, they are subject to content-related analyses; the text resulting from the philological-linguistic analysis is to be considered as textual evidence set against the background of a particular epoch of human (literary) history, in which capacity its content has meaning and, often, a communicative purpose (Düwel 2008: 16).

When every runic inscription has to be considered and interpreted against the circumstances surrounding its carving, and the relationship between inscription and the literary, social, economic, religious and various other facets of society at large need to be explored, it often boils down to asking "who could have carved this inscription" and "why did they carve it". This search for what Düwel (2008: 22) calls Sitz im Leben (maybe best translated as "situational context") is a natural consequence of the desire expressed by Liestøl (1974: 18), to make sense of an inscription that would otherwise remain obscure from a modern perspective. Yet due to our far from comprehensive knowledge of rune-carving societies, conclusive interpretations of inscriptions are not set in stone and remain open to re-interpretation and discussion at any point in time (Düwel 2008: 22). At the same time, the Sitz im Leben, the outcome of considering an inscription's text and its supposed purpose, often serves as a way of classifying runic inscriptions. This is, for example, visible in the section headings in *NIYR VI*: first those written in Latin, including *Ave Maria*- and *Pater noster*-inscriptions, then those pertaining to trade and lastly, the owner's tags.

This short overview illustrates how the grouping of inscriptions by certain criteria provides the basis for consistent publication, but also further analysis. Grouping inscriptions like this allowed for the realisation that wooden sticks with runic inscriptions apparently constituted a common and frequently-employed means of communication for a variety of purposes (Dyvik 1985: 135; also Liestøl 1968: 17; Düwel 2008: 203-204) and that they could contribute a very different and much more direct angle from which to re-examine historically attested events (Liestøl 1974: 33). The variety of topics, contexts and purposes exhibited in the Bergen inscriptions was nevertheless unanticipated and presented a challenge for scholars, since there are many different criteria by which to group. For example, quotes from famous poems are generally attributed to a very particular group within society, highly-educated men who were either wandering scholars or had spent at least part of their education abroad at universities in France (Vagantenlyrik; Liestøl 1974; Dyvik 1985; Knirk 1997; Marold 2000). This statement alone provides three choices of categorising inscriptions: quote, metrical/poetic inscription, carved by an educated person.

This list can be extended almost ad infinitum by also considering Futhark used, language of inscription (Latin/OWN), content/topic, a variety of stylistic criteria and so on. All of these approaches to categorisation are valid and serve their own purpose in analyses (Liestøl 1973: 129-130). It is hardly ever possible, when looking at a whole group of inscriptions, to do full justice to the peculiarities of each single one. Yet micro-analyses of a single inscription may do more or less full justice to all aspects of that inscription, but are hardly a reliable basis to draw conclusions about runic writing in general. Therefore the characteristics larger analyses (or categorisation systems) build upon often concern one specific aspect or a restricted number of aspects of an inscription, generally related to the research question. Unfortunately, many of the characteristics mentioned may appear in the same inscription, for example, any message may be noted down in any writing system available. A classification system based on the writing system may therefore group together very different inscriptions than one based on content/topic of the message itself.

Since the aim was to include these categorisations in TAKERUN to allow for analysing the relationship between different types of inscriptions and idionyms, the following sections provide an overview of how runic inscriptions have been classified by different scholars and how their varying systems were integrated into TAKERUN. The second part of the chapter illustrates how combining text classifications with the results from Chapter 5 helps to further our understanding of the Sitz im Leben of the various inscription groups in Bjǫrgvin.

6.1 Sitz im Leben: the importance of "who" and "why"

One main problem in integrating classification systems into TAKERUN originated from the difficulties of establishing categories so that there is no overlap (amongst others Liestøl 1973; Knirk 1997; Marold 2000). To illustrate the point, the different categories/types of inscriptions as presented by Liestøl (1973, 1974) are discussed in this section, along with how they were used to paint a picture of the Bjǫrgvin rune-carvers.

The major groups (without the author explicitly stating so) appear to be poetic inscriptions, inscriptions in Latin, inscriptions with a magical purpose, letters of trade, and notes and writing exercises (Liestøl 1973), subsequently split into sub-categories. Poetic inscriptions, for example, include Eddic and Skaldic poetry, quotes of Latin poems, love poems and poetry written by and popular with medieval university students and scholars, which is generally referred to as "Vagantenlyrik" (for example Liestøl 1973: 131; Dyvik 1985: 147). These inscriptions received particular attention since they represent important evidence for the literary history of Iceland and Norway (Dyvik 1985: 147) in that the group consists of text snippets quoting continental ("Amor vincit omnia") as well as Eddic and Skaldic poetry, which are characteristic for Scandinavia. Icelandic sources comprise the bulk of evidence for either of the latter two, leading to a discussion of what the new finds meant for the literary history of Norway. Liestøl (1964a: 35, 50-51) concluded that the Bergen inscriptions composed in the Scandinavian styles were to be seen as pieces of evidence filling a previously unrealised void, evening out the disparity in availability of evidence (Liestøl 1973: 130). The inscriptions, he argued, were proof that the literary and cultural framework in the two countries was more similar than different and that only the lack of evidence from Norway had previously skewed the picture, thus creating the impression that Iceland stood alone as the preserver of poetic tradition. In Liestøl (1974: 29), he expanded this to include a re-evaluation of the previous rough dating for the cessation of usage of the characteristic alliterative poetry in Norway.

Given the evidence, other scholars readily accepted this conclusion and focused their attention on the specifics of the poetic inscriptions and their content with a view to identifying those who had composed them in the first place. Since poetic inscriptions in the continental styles appear in Bjǫrgvin, at times even physically alongside metrical inscriptions utilising Scandinavian forms of poetry, the relationship between the two traditions came into focus (most notably on B-145/INS267, see also Liestøl (1964a, 1973); *NIYR VI*). Of particular note is Marold (2000), who discussed what practical purpose these inscriptions might have fulfilled in daily life, and the wider implications regarding cultural exchange between Norway/Bjǫrgvin and the continent by paying special attention to the parallels between the inscriptions and the literary motifs employed in traditional courtly poetry on the continent. She corroborated Liestøl's conclusion that these inscriptions were most likely composed and carved by those inhabitants of Bjǫrgvin who had enjoyed education abroad, mostly clerical personnel and people of high social status (Liestøl 1973: 135; Marold 2000: 196). These carvers were therefore most likely capable of utilising runes and Roman script depending on context. This in turn ties into the results of the onomastic analysis, which indicates that (wo)men carrying idionyms used among the diplomataria-writing population also carved runes.

While the scholarly importance of these inscriptions can be agreed upon, their classification is a very different matter. That some of these poems are actual quotes has proven important in re-evaluating prior assumptions about the kind of literature received in Bjǫrgvin through the mediation of well-travelled and -educated scholars (Liestøl 1973: 135) and the abeyance of the old forms of poetry in

Norway (Liestøl 1973: 130) does not help determine whether they should be classified as quotes, texts with parallels elsewhere or simply poetry. Moreover, if they are classified as poetry, should the *topic* also be taken into account, and should "love poetry" then constitute its own subgroup? Eddic as well as Skaldic and Vagantenlyrik verses may centre around it, as is amply proven by INS1, INS511 and INS331 (Marold 2000: 190), but if this approach is chosen, decisions have to be made about the hierarchy within the classification system. Is it the *style* or the *topic* of a poetic inscription that decides which group it belongs to?

The situation is equally unclear when inscriptions quoting Latin phrases, which appear for example in the form of *Ave Maria*-inscriptions or quotes from Christian ritual (Liestøl 1973: 132), are considered distinct from quotes in OWN. The purpose of many of these inscriptions was likely not restricted to serving as a reminder; they may instead have served as protective measures for example for food and drink, or even writing exercises (see the arguments in Seim 1998). The language of inscription, however, is the same, so one can only assume that Liestøl (1973) was still thinking along the lines of text genre at this point; this distinction is not made in *NIYR VI*. In 1973, he also still mentions prayers, benedictions and invocations as belonging to the Latin inscriptions. Yet magical inscriptions (amulets and charms) form their own group as well, and benedictions quoting Christian texts are mentioned as belonging to this group, too (Liestøl 1973: 133).

While they certainly pose difficulties in terms of classification, in the case of poetic inscriptions scholars can at least fall back on using well-established classification systems from literary studies. The nature and content of other inscriptions, however, is not what most literary scholars deal with on a daily basis. Liestøl (1973: 135, my translation) states that "to all appearances, runic literacy was wide-spread amongst the Bergen population"; it certainly seems that people have made enthusiastic use of their skill to record all kinds of messages, possibly the most lewd of which can be interpreted as an advertisement for (or recommendation of) a local prostitute: "You shall fuck Rannveig the Red. It will be bigger than a man's penis and smaller than a horse's penis" (INS595).

Classification systems for literature, in general, do not account for such messages and notably, whenever the off-colour inscriptions from Bergen are quoted as a previously unexpected use of runic script, this inscription is delicately omitted (except in Knirk 1997: 27). Nonetheless, Liestøl (1970) devotes a whole article to a similar inscription (INS470), a play on OWN "fuð" (cunt) and three historically known men's bynames. He designates such inscriptions, in turn, "ufin", "uartig" (dirty; naughty) or "unorthodox" (Liestøl 1974: 24, 1964a). Dyvik (1985: 135), rather aptly, describes them as "toalettvegg-innskrifter" (toilet stall inscriptions), and Liestøl (1974: 23-24) refers to them as "tavern" or "pub" messages. This is, of course, a modern term and interpretation; these days, one might perhaps be tempted to label some of these inscriptions "medieval tweets" or "Facebook status messages". That does not mean they were carved in a pub or similar contexts, so this particular classification should be taken with a grain of salt.

This group of and other inscriptions which may have been writing exercises (Liestøl 1974: 32; Seim 1998) appear to have contributed a great deal to the re-evaluation of who exactly made use of runes in Bjǫrgvin, which had consequences for how runes as a writing system were perceived: instead of a system restricted to the upper echelons of society, much like the Roman script, and to very specific purposes, it was now termed "den alminnelige manns og kvinnes alfabet" (everybody's alphabet) (Dyvik 1985: 142). Yet that raises other questions; the three men from INS470 can potentially be identified as belonging to some of the highest-ranking Norwegian families (Liestøl 1970), but did they carve the inscription themselves to make fun of their own bynames or was someone else making fun of them? Neither possibility can be discounted (Liestøl 1973: 138, 1974: 24-25; Knirk 1997: 28) and the crudeness of an inscription cannot be used as an indicator of low social status, regardless of how tempting it may seem.

If anything, it is the sheer number of inscriptions which suggests carvers from different social circles. Seim (2013: 149-150) also offers as an explanation that the sudden rise in the numbers of inscriptions may have been due to writing becoming more common in society as a whole. Following a similar train of thought, Liestøl (1973: 138) suggests another re-evaluation concerning the driving forces behind the use of runes in Bjǫrgvin, the merchant community at Bryggen. Inscriptions connected to them are characterised as a group more by their common topic than their form, although the so-called owner's tags also have very distinctive physical characteristics, mainly holes through which a piece of string could be threaded or hooks keeping them attached to for example skins they were stuck into. Given how many of these inscriptions appear in Bergen, Liestøl (1973: 138) ponders whether knowledge and use of runes might therefore be more prevalent within the merchant community than the upper social classes, quoting the need for an easy way of communication between merchants in different trading towns and similar finds from said towns, an argument picked up by Johnsen (1987). It is, again, an intriguing hypothesis difficult to prove or disprove. Using wooden sticks for correspondence to be transported across large bodies of water seems vastly preferable than to convey the same message orally or by means of parchment and ink. Wooden tally sticks serve similar purposes and are found in Bergen, so the practice is known.

Poetic and off-colour inscriptions as well as owner's tags are the most common types of inscriptions in the material, but there remains a plethora of others: business correspondence, debtor's lists, private correspondence, compliments ("Asbjǫrg the best child", INS622), magical inscriptions, the list is extensive, as was the number of purposes these inscriptions fulfilled. Another well-known example is INS478, a letter written by Sigurðr Lavarðr, heir to King Sverrir, where he either requests a longship owned by the unknown addressee (Liestøl 1968: 19-21, 1973: 137) or weapons to be fashioned from the provided amount of iron (Dyvik 1985: 144). The historical value of this rune-stick can hardly be overestimated – this is a contemporary document giving direct insight into military matters. While too much context is lacking to tie INS478 to a certain event during the Norwegian Civil Wars, it is nevertheless an astonishing document.

Storing information about the Sitz im Leben of runic inscriptions in a runic DB is desirable since the ability to search for inscriptions with shared characteristics ensures that future scholars can compile corpora for certain studies more easily and quickly. In fact, I suspect that in actual use, this would be the *preferred* way for most runologists to look for a single inscription – it is by far easier to remember the contents than the actual character sequences involved – not to mention that different normalisation systems present their very own obstacle. Yet normalising the interpretations into an accessible system compliant with data normalisation rules is difficult owing to the above-mentioned contradictory possibilities for categorisation; as far as Liestøl's is concerned, it is easy to see that it consists of a mixture of genre attributions (poetry; Eddic, Skaldic, Vagantenlyrik), text content (love, love-sickness etc.), purpose (benediction, charm, invocation) and what may for lack of a better word be termed "literary observations", i.e. whether an inscription is a recognisable quote from a different source. These are all important pieces of information, but they are so disparate that it is hard to combine them into one overarching, consistent classification system. Liestøl was not aiming to produce such a system either, merely looking to present the newly discovered inscriptions in some sort of order (Liestøl 1964a: 5), which is turned around in Liestøl (1974), where roughly the same inscriptions are presented in a re-arranged order. While inscriptions presented and classification thereof remain mostly the same, this is further indication that said classifications were not necessarily meant as a strict system to help future scholars classify more inscriptions, but rather as a means of presentation.

Storing Sitz im Leben for a runic inscription is therefore a challenge in terms of data modelling and instead of developing a full-blown, consistent and overarching classification system, I opted for developing a DB-friendly workaround building on prior classifications, namely *NIYR VI*, Liestøl (1964a,b, 1968), Knirk (1997) and Marold (2000). This list, it should be noted, does not include all publications either presenting an overview of all or concerning themselves with a few select inscriptions; the aim was to collect as many interpretations of different inscriptions as possible. It therefore seemed prudent not to spend too much time on trying to catch every interpretation available, but rather work with a smaller dataset sufficiently large enough for testing the workaround. All in all, 209 inscriptions were tied to interpretations regarding their broader context (Query C.29, C.30). The following sections concern themselves with the technological implementation before the analysis will be taken further by using the classifications in conjunction with the results obtained from the analyses in the onomastic chapter.

6.2 TAKERUN: classification labels for runic messages

The greater flexibility of a RDBMS as opposed to a printed publication, can solve the problem of overlapping categories by using data structures permitting different aspects to be appropriately captured, stored and utilised to find certain inscriptions. The simplest solution is to use a tagging system permitting scholars to assign more than one label to any given runic text, thus mirroring different possible classifications. There cannot be an unlimited number of different labels, however; discretion needs to be applied when deciding which aspects of pre-existing classification systems will be used. TAKERUN already addresses several possible ways of classifying inscriptions in other entity types. Language of inscription, for example, was shifted into PATTERNING. Nothing is lost by doing so, either, since querying for all inscriptions containing Latin remains possible. PATTERNING even includes several more options not used in the present study, for example BOOLEAN columns indicating whether inscriptions contain characters other than runes. This also helps separate different ways of establishing classifications systems based on qualitatively diverse criteria, like text genre and language of inscription. The next sections outline the variety of labels/tags.

6.2.1 TTAGS: label entity

Despite best attempts to keep the number of labels restricted, the diversity of the Bergen inscriptions still resulted in 41 labels being used to represent scholarly conclusions and comprehensive interpretations in TAKERUN, stored in TTAGS (Table 27). The entity type itself has only three attributes: the required PK in the form of *ttagid*, a longer version of the tag's designation in *ttagname* and a definition of the criteria triggering a specific tag, *ttagcriteria* (Table 28). Since flexibility and the opportunity to include prior classification systems into TAKERUN were given preference, the tags in TTAGS are not restricted to text type/genre; they include tags for as many aspects of a comprehensive interpretation of a runic inscription as possible. While Liestøl's classifications may lack consistency, there is a lot of merit to them, namely in how they focus on the text and which emotions, experiences and activities it reflects – something which could loosely be termed "topics". This descriptor was chosen because, as in conversation, the topics of one runic inscription may be manifold, overlap, cross, go off-topic and return. While a classification system based on formal criteria can help runologists find their way through the corpus, the topics provide additional information, "what people talked about".

Several authors also take interpretation a step further and attempt to provide information about the carver's educational background (for example Liestøl & Johnsen 1980-1990: 18, 69; Marold 2000: 194), the (assumed) original purpose of the inscription (Liestøl 1964a: 16; Marold 2000: 195; Knirk 1997: 28) and/or the possible situational context in which it was carved (mainly Liestøl 1964a). Seim (1998: 35) also adds "funksjon, bruk og hensikt", which can be translated to "purpose", "use" and "underlying intention", while at the same time cautioning against broad statements concerning either, for there is often little actual evidence to base any conclusions upon. All of these, in turn, provide yet other means of classifying inscriptions, however speculative. Moreover, they are situated within the level of interpretation referred to as Sitz im Leben and thus important pieces of scholarship.

Fully incorporating such comprehensive interpretations into a RDBMS-based system is tricky in terms of technological implementation and potentially inadvisable with a view to usage by the broader public. As a means of collecting interpretations within a runic DB meant for use by scholars, however, it can be quite useful to include such comprehensive interpretations, if only to enable comparison between several scholars' takes on different inscriptions. At the same time, with the level

Column Name	Data Type	Length	PK?	Not Null?
ttagid	varchar	5	true	true
ttagname	varchar	25	false	true
ttagcriteria	varchar	255	false	true

Table 27. *Table structure* TTAGS.

of data normalisation required to render the comprehensive interpretations into a DB-compatible format, it goes almost without saying that the complexity involved in these interpretations is beyond the scope of what the entity model can mirror. However, even by storing an abbreviated version, it is possible to generate subsets of inscriptions and then access the literature in question, where the full discussion can be found by making use of the *-source*-columns. Again, it is important to remember that TAKERUN is a tool meant to support scholars in building an argument by providing information and a way to quickly build data subsets for possible analyses; it is not a replacement for engaging with the scholarly debate.

6.2.2 Rune message "types"

17 items in TTAGS can be considered as referring to different "types" of runic inscriptions, mostly based on some formal criterion, e.g. whether the inscription is metrical or contains some formal greeting (Table 28). Of these, *ambiguous, not interpretable* are used when the type is not clear (meaning none of the other tags apply) or when the text is too damaged for interpretation (scholars can disagree on that as on everything else).

Balance sheet, list are used, respectively, if listed items appear in a text, with the former being a very specific kind of list. *Følgeseddel (label), owner's tag* are texts either providing information about who an item or goods belong to, or who is sending whom what kind of item/goods. *Personal name (PN)* is a specific category; while many inscriptions carrying only idionyms are considered to be ownership declarations, that does not necessarily mean they were and the two tags are therefore kept separate.

Of the tags *poetry, quote, motto, word play*, the first two were discussed above, whereas the third is only applied to one single inscription (Liestøl & Johnsen 1980-1990: 19). The fourth concerns texts (supposedly) being plays on words.

Incantation, prayer were both included, although they need not be mutually exclusive. Yet "prayer" is often coded as specifically Christian and was used in the literature in such a way that I felt it necessary to include it. On a less spiritual level are the tags *comment, letter, writing exercise*. The main difference between a "comment" and a "letter" appears to be the form of address, which was accepted as a distinction.

The last tag is *unfinished*, used for instances where the inscription remains unfinished; the tag can be used in combination with any of the others.

6.2.3 Rune message "topics"

While the labels presented in Section 6.2.2 all refer to one or more formalistic criteria, the 22 tags here are considered "topics" or "content-related". *Incantation, not interpretable, owner's tag, prayer* and *writing exercise* already appear in Section 6.2.2 as a result of the tags being in use as either (see Section 6.2.5 for the reason).

Bad indicates that one of the other content-related tags is in some way negative – in combination with *love, magic* for example, the original interpretation can have been "love-sickness" or "dark magic".

Instruction, liturgy, official, refer to, in order, a set of instructions being given, the text content being related to Christian liturgy, while the last is reserved for text content concerning affairs of state, like for example taxes.

Compliment is self-explanatory; the difference between *sex, smut* is the level of explicitness (the above-quoted Rannveig-inscription warrants the first, the second is used mainly when no explicit language is used).

Tag ID	Tag name	Tag criteria
am	ambiguous	everything else
amu	amulet	any text supposedly serving an amuletic function
ana	analphabet	not skilled or entirely analphabetic in either script
bad	bad	topic is mentioned in a negative way, i.e. lovesickness
be	benediction	benediction
bs	balance sheet	counting up goods and debts
chr	christian	anything connected to Christian beliefs, figures, saints etc.
com	comment	statement of some sort
eti	følgeseddel	følgeseddel, etikett
in	incantation	spell, charm, formula, appealing to some higher instance
ins	instruction	recipe, usage instructions
learn	learned	person who has enjoyed some education, possibly even abroad
let	letter	text using formalised language
li	liturgy	anything connected to Christian liturgy
list	list	text counting up names, days etc.
luv	love	mentioning love in any way
ma	magic	somehow connected to magic, whether Christian or heathen
mne	mnemo-device	text written to help one's memory, e.g. during a performance
mot	motto	*NIYR VI*, 19
ni	not interpretable	cannot be interpreted to make any sense
nor	norse mythology	anything connected to norse mythology, beliefs, gods etc.
off	official	concerning official business of state, e.g. taxes
ords	ordspill	play on words
own	ownership tag	personal name and a form of eiga
p	poetry	Edda, Skaldic, Vagantenlyrik or simply metric
pc	period context	text indicates relationships to current events
pn	personal name	personal name only, notwithstanding non-lexical sequences
pray	prayer	prayer
pub	pub environment	pub environment
q	quote	quoting text known from another source (parallels included)
ref	references	references to mythology or events, used consciously to a purpose
reg	regular	moderately educated person skilled in writing runes, if not Latin
rel	religious	generally with some religious significance
rist	carver formula	x carved
ros	compliment	complimentary utterance
sex	sex	as in intercourse
smut	smut	lewd utterances using sexualised language
teach	teaching	used in a teaching context
tra	trade	concerning trade, commerce or business transactions
un	unfinished	text that is interpreted to not have been finished
we	writing exercise	text interpreted as having been carved in order to practice characters

Table 28. *Overview of the 41 labels in* TTAGS*, including how each label is defined.*

Teaching refers to content that was supposed to be learnt.

Two more tags concern religion, *christian* and *religious,* with the first specifically used for anything concerning Christian mythology, ritual or liturgy, while the second is more of an open tag and refers to any content somehow connected to religious aspects of society, Christian or heathen. It is not to be confused with *references,* also used for mythological connections, but specifically meant for *literary* references to mythology, for example in quotes of classical poems, where they serve as a literary device.

Further, the tag *period context* is quite important; again, the content of the text references some event or person, but as opposed to *references,* these have to be historically attested events and persons. It cannot be used for an inscription mentioning Þórr, whereas Óláfr hinn helgi qualifies when not referenced as a saint.

The *carver formula*-tag would probably fit better into the prior section, but the text in question is listed as an owner's tag in Liestøl & Johnsen 1980-1990: (192) (Section 6.2.5); it therefore does not appear as a "type-"tag.

The final item on the list, *trade,* is self-explanatory as well.

6.2.4 Carver, purpose and situational context

The last group again reuses some prior tags: *ambiguous, incantation, magic, owner's tag, teaching* already appeared. When used within this context, they refer to the identity of the carver, the (supposed) purpose of the text and the situation in which it was carved. It is easy to see why for example *incantation* can be considered either: incantations can be distinguished from other types of inscriptions by phrasing (for example "hail [insert god of choice]"), but they are also meant to fulfil a specific function, namely establishing contact with a supernatural entity. *Incantation* therefore doubles as a descriptor for the characteristics of the text and its purpose. It depends on the scholar and their particular classification system whether they use *incantation* as a reference to the text structure or the purpose. Similarly, *owner's tags* distinguish themselves from other inscriptions by consisting of a set expression, but they are also meant to indicate possession. These two examples illustrate why it is so difficult to establish a clear-cut classification system.

Two more tags not used as type within this particular corpus refer to either type or purpose: *amulet, mnemo-device*. The first is closely related to *incantation* and describes an item meant to protect the carrier against some sort of misfortune. The last item, *mnemo-device,* is meant to help their user recall specific information, for example the phrasing of a particular poem Marold (2000: 195) suggests that several of the metrical inscriptions could have been used as such mnemo-devices in a reading or staging of a poem, an interpretation opening up interesting venues of investigation concerning community activities in Bjǫrgvin.

This leads to the tags concerning the identity of the carvers, or rather, their level of knowledge. In all five publications the system is based on, the three levels of actual runic knowledge appear to be *analphabet, regular, learned*. The first only appears once in connection with a ring (Liestøl & Johnsen 1980-1990: 69). The other two are more frequently used, although the level of runic knowledge is not ascertained for every inscription in the corpus. A rune-carver with *regular* knowledge may, for example, have carved INS46, in which "[t]he use of punctuation marks, or rather the lack of them, is confusing [...]" (Liestøl 1968: 23). The tag is used when the use of runes and punctuation (so it exists) shows a certain degree of familiarity alongside some inconsistencies. Whether that actually indicates that the carvers were not exceptionally well-versed in the use of runes is another question; this may well have been common amongst those not overly familiar with the standardisation of Roman script and Latin.

The tag *learned* appears most often. It applies when the carver is considered to possess good knowledge of runes as well as Latin and possibly received their education abroad – basically a very specific group of men right at the top of society, although opinions concerning rune-carvers' familiarity with the medium they are using are, on the whole, rare in the scholarly literature. Even rarer are suggestions in which social context a runic inscription may have been carved, so only one tag exists so far, *pub environment*. It is based on and

Column Name	Data Type	Length	PK?	Not Null?
textid	varchar	10	true	true
ttagid	varchar	5	true	true
pctw	varchar	10	false	false
tagsource	varchar	30	true	true
tagsource	varchar	10	false	false

Table 29. *Table structure* TEXTTAGS.

mostly used for the inscriptions mentioned above, which Dyvik (1985: 135) refers to as "toilet stall inscriptions". This is likely the farthest the interpretation of an inscription can be taken to when its Sitz im Leben is established. As mentioned above, considering an inscription as a "pub joke" presents a modern assumption concerning the kind of situation where such utterances would be considered acceptable today.

The survey of tags and their varying application to text type, content and purpose illustrates why a flexible system is preferable, especially when the aim is to mirror prior scholarship. However, that also applies to mirroring their use of the tag in question.

6.2.5 TEXTTAGS

Since a text can have multiple tags and a tag can be applied to multiple texts, a JOIN is required, TEXTTAGS. Its compound key consists of the FKs *textid, ttagid* from, respectively, TEXTS and TTAGS, and *tagsource* as an additional FK to prevent data redundancy. Because of the difficulties of establishing clear distinctions between different text types, content, usage and purpose, notwithstanding the frequent overlap, creating several entity types for tags would have resulted in redundant entries. However, being able to store whether the scholar in question considered a certain label as referring to type, content, purpose or usage was decidedly desirable. Since the views on which label belongs to which category can differ as well, it did not seem prudent to attach a firm categorisation to each label by itself, but rather attach the reference to each token as it was entered. The column designated *pctw* contains what the tag refers to in this particular instance, with five options available: *purpose, content, type, writer* and *situation,* indicated by the letter *p, c, t, w, s*. The attribute can and probably should often be left empty, but it is thus possible to indicate for each individual instance whether the tag is used as referring to the "type" of the inscription or its content. The two *source*-columns provide the literature reference – although it is at times difficult to decide what it refers to. The publications often do not differentiate between "type, content, purpose", so entering a value in that field was educated guesswork. It has the benefit though of being able to mirror a scholar's classification system, if there is one; querying TAKERUN for all tags used by a particular scholar used as indication of "type" thus becomes possible, while only querying for all inscriptions with a particular tag attached, whether it refers to type, content or purpose, is also possible.

By nature of the data, this approach is neither clear-cut nor fail-safe. Within the present sample, it worked, but that may be owing to the fact that three of the publications on which it is based were written by the same author – albeit with a number of years in-between – and that all other scholars quoted were working with materials he compiled. Since not all texts are tagged at present, in the current state the system can at best provide some orientation within the corpus. If applied at a larger scale, this approach could prove quite useful, although larger-scale research on various classification systems of runic inscriptions is advisable before the *pctw*-column can be used properly. The tagging system by itself works quite well, especially since there is no restriction on how many tags can be connected to a single inscription. Provided the choice of tags is restricted (and the criteria for applying each tag are clearly defined), this system provides another, much more philologically-oriented approach to querying the DB. One last aspect needs to be discussed in regard to this section of the research database: which entities are the tags actually attached to?

6.2.6 TEXTS: what counts as one?

Seeing as the inscriptions themselves are broken up into their separate sides in every table from UNIRUNES to PATTERNING, the contents themselves are, accordingly, also broken up into fragments if they stretch over several sides of the inscription, so the entities that TEXTTAGS connects to are not easy to define either. The problem is that, while from a DB-designer perspective, each fragment is still its own entity, from the philologist's perspective, the fragments are very much connected and can only be understood (and subsequently tagged) when considered as a whole. Both of them are right, too, so there is no middle ground to be found here.

For the philologist, the definition of what constitutes a "text" is not easy to begin with, since a collection of different stories (like the Bible) can be considered a "text", but then so can one instance of an idionym. The problem was mentioned in relation to the entities in INSCRIPTION (Section 4.8.1), but in principle, it again boils down to the observation by Seim (1998: 10-11; page 56) that the term "inscription" in itself is contentious. When designing INSCRIPTION, the decision was made to use the second, broader definition for what constitutes an "inscription" as a basis for what should be considered an entity within the table. Throughout UNIRUNES, TRANSLITERATION, PATTERNING and NORMALISATION, each side of an object was also considered its own separate entity, following the practice of distinguishing them by a letter.

Starting from TEXTS, the first definition of "inscription" applies: a "text" is therefore defined by its inner coherency and "consistent linguistic structure" (Düwel 2008: 16). In other words, from here on, the definition of a "text" depends on what a scholar considers to be a coherent, independent entity. This decision to push the re-definition of "inscription/text" so far back in the entity model needs some explanation. There are three different points in the deciphering process where this can reasonably be expected to become a problem, represented by PATTERNING, NORMALISATION and anything that follows. The argument could be made that it is at the stage of patterning an inscription that the runologist first has to consider which sides of the object belong to each other so they form a coherent text, so the corresponding entity type in the DB is where the different sides should be tied together and then interpreted as a whole. Yet PATTERNING, at least in TAKERUN, represents the stage of the deciphering process where the runologist is still more or less free to consider possibilities, and not every possible pattern will result in an interpretable piece of text. That does not mean that these possibilities should not be considered and entered as such. The Bryggen inscriptions in particular are known to have been altered after their usefulness had expired, they were purposefully destroyed, broken, burnt or otherwise maculated (Liestøl 1973: 129). Runologists are therefore left with, not a ready-to-read piece of text, but fragments interspersed with lacunæ and hard-to-identify runes. Any pattern derived from this is necessarily one possibility of several which cannot be wholly ruled out, even if they do not at present provide an interpretable piece of text. Restricting the freedom of the runologist during the process of deciding on an interpretation already at the patterning-stage does therefore not strike me as wise.

Once NORMALISATION is reached, runologists have reached a conclusion about which pattern is likely correct and provide what they think the sequence of signs should look like in grammatically and orthographically correct Latin/OWN, although since the latter normalises differently depending on where the runologist has learnt their OWN, there can be variations. This necessarily entails making statements about which parts of the inscription belong together in which order. Therefore NORMALISATION seems to be the entity type where the broken-up pieces of text should be reconnected. I decided against it for what may be considered a contentious reason: normalisations are still fairly close to the original sentence structure and word order of the transliteration. Yet if the normalisation collects all parts of the inscription, it becomes more difficult to tell which sequence from a transliteration was normalised into which

Column Name	Data Type	Length	PK?	Not Null?
foreignid	varchar	10	true	true
textid	varchar	10	true	true
textorder	int	2	false	false
textsource	varchar	30	false	true
textsourcepg	varchar	8	false	true

Table 30. *Structure of* TEXTS.

word in OWN. While TAKERUN is at present not the most convenient tool to study how runic sequences are normalised, I wanted to at least retain some possibility of conducting such a study, for example by querying for a specific combination of runes in UNIRUNES, where the NORMALISATION needs to contain a certain combination of Roman letters. It would be much more cumbersome if NORMALISATIONS contained the whole of the sequence without providing any hint which rune transliterates to which Roman letter sequence. Certainly this can be worked out, but the longer the text, the more likely it is that character combinations appear, which would impact on result sets. In view of this and until a better solution can be developed, NORMALISATION therefore retains the structure of the preceding tables.

Recombining fragments into a text therefore happens after NORMALISATION. TEXTS contains five columns, two of which form the PK for the entity type. Two other columns contain the relevant literature reference. In this table the text fragments are reconnected by being linked to the same *textid*, and *textorder* provides the order in which they should be reconnected (which may differ from the reading order the letters of the respective sides indicate). However, they are not connected in quite the way they are on the object itself, because the entity type TEXTS switches from relying on the physical reality of the object sides to the more abstract concept of textual entities. Therefore, one side of an inscription can carry more than one text, and three sides of an inscription still make up only one. Here the philologist part of TAKERUN begins and continues into TTAGS (see also Section 6.2.7).

The entity model for this part of the research database is thus made up of three additional entity types connecting to either NORMALISATION or PATTERNING (Figure 30). The reason why some of the texts connect to NORMALISATION, while others take their FK from PATTERNING is that NORMALISATION only contains sections of inscriptions where a normalisation into OWN/Latin can actually be provided. Therefore a number of texts do not appear in it, including single idionyms, futharks or uninterpretable sequences. From a philologist's perspective, these are still texts and can therefore be interpreted and tagged, for example a Futhark as a *writing exercise* (Seim 1998). In these cases, the only PKs available are those from PATTERNING. This necessitates running two slightly different queries to make sure all results are returned (Query C.36, C.37); the results can still be combined into one result set by using the UNION-clause.

6.2.7 Implementation difficulties

To illustrate how the transition from the purely physical entity of an inscription to the abstract entity of a text is mirrored in TAKERUN, two examples. When a scholar identifies two (or more) distinct texts on the same side of an object (see page 135), as in the case of the d-side of INS267 (carrying the last line of a Skaldic poem and "omnia vincit amor"), they are identified as separate texts by being given different PKs. The *normid* is connected to either *textid*, thus linking either text back to the inscription.

In cases like INS38, which was potentially carved by three different people, perhaps even at different points in time (Liestøl & Johnsen 1980-1990: 85), it is more complicated. INS38 is a collection of phrases potentially connected to healing magic, but are they five different texts, or are they *one* text consisting of different magical formulae meant to

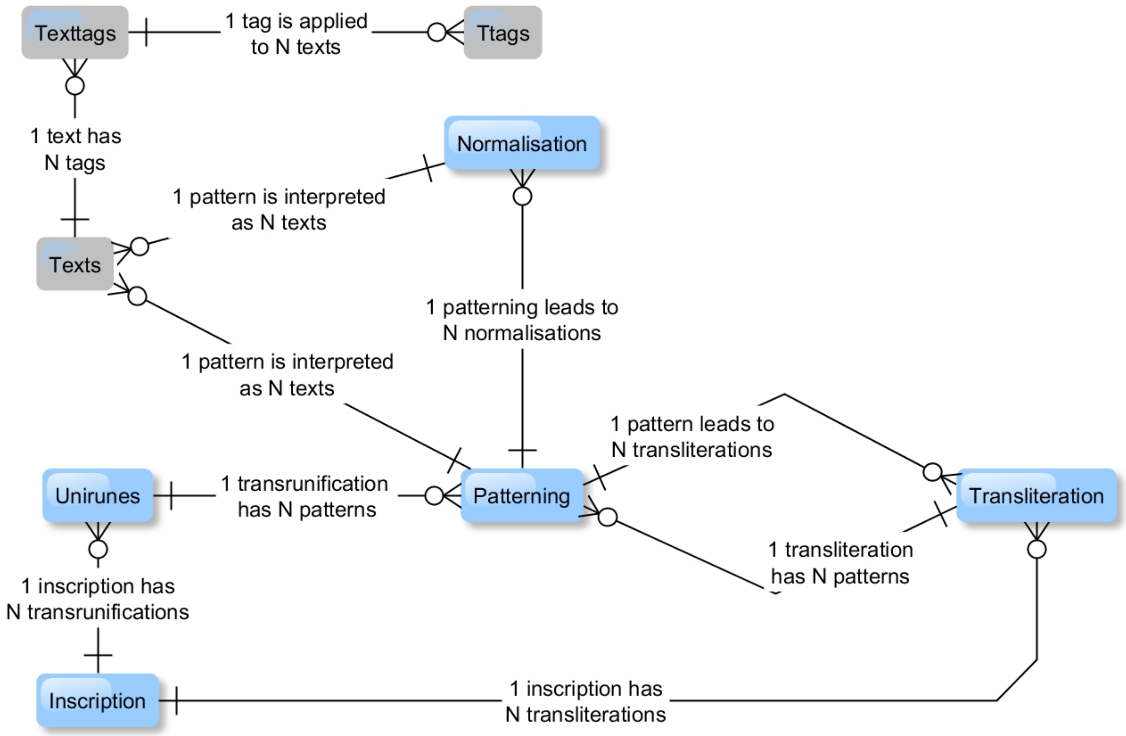


Figure 30. *Entity model including core and qualitative text analysis entity types.*

work in conjunction? The object also sports an owner's inscription reading "Klas owns" (Liestøl & Johnsen 1980-1990: 83-85). To properly mirror these different possibilities, seven new *textids* were entered as separate entities into TEXTS. Five of them consider each side as a text by itself, whereas option six combines the two sides which Liestøl & Johnsen (1980-1990: 85) state were carved by the same man, and option seven considers the four magical formulae as one text opposed to the ownership formula (Query C.38).

Each of those seven texts needs to be tagged separately, which explains why this part of the research database is not suited to conducting statistical analyses in its present state. There are too many options of constituting a text, and if there are different normalisations for even one side of an inscription, there are automatically two different texts as well. Equally, if there are four patterns for the same side of an inscription, this results in four different texts being logged. While the RDBMS still mirrors reality, at this stage reality is too diffuse and varied to be of use for statistical analyses, and as a result, TEXTS logs a lot of entries.

A particular problem likely to also appear in connection to other inscriptions, presented itself when using literature that did not include transliterations of its own, or, for that matter, inscription numbers, for example Liestøl (1964a). Therefore some interpretations could not be attached to their respective inscription, simply because it was not entirely clear which he was referring to. Knirk (1997) made use of both B- and N-numbers (the latter referring to *NIYR VI*), and Marold (2000: 196) also stated which transliterations were used as the basis for her article (equally a mixture of B- and N-numbers). The text was then attached to the *patid* or *normid* quoting the relevant publication. Where no indication was given, they were attached to the Rundatabas-normalisation/patterning, since it would otherwise not have been possible to use the tagging system as a supplement to see which information could be gleaned by combining tags with the results from Chapter 5.

6.3 Idionyms and texts

Adding the tagging system to TAKERUN was an experiment aimed at determining which insights combining different kinds of information about groups of inscriptions and the use of certain idionyms in Bjǫrgvin could yield. For this purpose, only the 129 idionyms considered high-status or low-status Norwegian/Icelandic/pan-Scandinavian (Query C.39, Section 5.8) were used. χ^2-tests were not employed, since only 209 inscriptions were tagged and because of the problematic situation with the entities in TEXTS. This section is therefore a presentation of observations, how they support or contradict the diplomataria evidence and how they fit with the conclusions the above-mentioned scholars drew regarding the composition of the rune-carving population of Bjǫrgvin based on their examination of the corpus. This includes considering what evidence supports merchants as the driving forces behind the continued use of runes in Bjǫrgvin and how high-status idionyms relate to inscriptions referencing classical sources, making use of poetry.

While modern views may influence the picture, the inscriptions indicate that runes were a writing system available to and used by a number of citizens in Bjǫrgvin (Knirk 1997: 26; Johnsen 1987: 717). The question is whether asking "who" and "why" for single inscriptions or groups thereof coincides with what the idionyms currently indicate concerning the rune-carvers' social status. The six groups of idionyms the onomastic analyses resulted in, are therefore considered in relation to the tags those inscriptions were assigned. This can be achieved for each single idionym by using Query C.40 or by making use of a VIEW combining idionyms, tags and social status into one (Query C.41). It is then possible to query how often a specific idionym was connected to a certain tag. Query C.42 works like Query C.6, counting different instances of each token. Owing to how idionyms received their social status-association, no distinction is made at this stage between interlocutor- and invocation-marked tokens.

For ease of reading, the different groups are referred to in shorthand: IH (Icelandic high-status), IL (Icelandic low-status), NH (Norwegian high-status), NL (Norwegian low-status), PSH (pan-Scandinavian high-status), PSL (pan-Scandinavian low-status). Table 37 provides a generic overview over which tags are connected to which groups of idionyms, with a name-by-name list to be found in Tables 31 to 36.

6.3.1 High-status Icelandic idionyms

Potentially Icelandic high-status idionyms are connected to 22 different tags (Query C.43): *ambiguous, amulet, balance sheet, carver formula, christian, comment, incantation, letter, magic, not interpretable, owner's tag, period context, PN, poetry, prayer, pub environment, quote, religious, teaching, trade, unfinished, writing exercise*.

The range of tags indicates that IH-idionyms appear in inscriptions (although not necessarily texts, Section 6.2.6) covering a broad range of activities taking place in Bjǫrgvin, trade being part of this as much as politics (period context) and magic. The majority are connected to tags implying some sort of trade or ownership signalling (owner's tag, Table 31), although owner's tags more or less by default get tagged as "trade", which does not need to apply. People can mark items in their possession with a tag without having any intention to sell/trade them; nonetheless, since the tags were added according to the literature, *owner's tag* and *trade* often appear together.

Those tagged differently or with additional tags for the most part had a religious/magical purpose according to the literature. One notable example is *Egill*, connected to poetry, although saga-hero Egill Skallagrímssonr, despite being a renowned poet, is almost certainly not who the inscription refers to. *Erlendr*, a high-status idionym, appears with "pub environment". That this idionym *only* appears in an inscription tagged as "pub environment" raises the question of whether this observation presents a contradiction with reality or merely a contradiction with scholarly expectations of which types of inscriptions a man named *Erlendr* should appear in. *Hákon* is within expected parameters, being a high-status idionym carried by several Norwegian kings and in the inscriptions part of an *unfinished letter* possibly relating to historical events.

These three examples illustrate some of the problems when working with social status and social identities of people from the Middle Ages: while literature, stories and contemporary sources provide some insight into the social framework these people operated within, in reality these social

Idionym	Tags
Ari	christian, comment, owner's tag, PN
Arni	owner's tag, PN, trade
Benedikt	christian, incantation, magic, not interpretable, owner's tag, quote, trade
Brandr	owner's tag, trade
Egill	poetry
Eindriði	owner's tag, PN, trade
Erlendr	comment, pub environment
Eyjolfr/Eyiólfr	owner's tag, trade
Finnr	owner's tag, trade
Gísl	owner's tag, PN, trade
Hákon	letter, period context, unfinished
Hálfdan	owner's tag, trade
Ingimundr	balance sheet, trade
Kárr	owner's tag, trade
Ljótr/Liotr	not interpretable, owner's tag, PN, trade
Markús	ambiguous, christian, incantation
Rúnolfr	owner's tag, PN, trade
Sighvatr	carver formula, owner's tag, trade
Sǫlveig (f)	owner's tag, trade
Thomás	amulet, christian, incantation, magic
Vilhelmus/Vilhiálmr	amulet, christian, incantation, magic, prayer, quote, religious, teaching, writing exercise
Þorgrímr	owner's tag, PN, trade
Þorlákr	owner's tag, trade
Þorvaldr	owner's tag, PN, trade
Þorvarðr	owner's tag, PN, trade

Table 31. *Icelandic high-status idionyms and the tags they are connected to.*

frameworks were much more extensive and complicated than the glimpses afforded to us. Just like we do not know whether some of the inscriptions were really carved during a "fun night out", because we do not know if they were only considered appropriate within that particular setting, we also glean only glimpses of the rune-carvers' lives and identities via inscriptions. It is not a question of "was Erlendr really of high social status considering the kind of inscription he is connected to", but rather a question of "what kind of social situation was Erlendr in when that inscription was carved, how old was he, was he conforming to or deliberately breaking societal norms", and the list could be extended almost indefinitely. There is also no reason to assume that all rune-carvers were adults; children and teenagers may have added their contributions without us being able to tell. Like humans today, rune-carvers were products of their time and circumstances, their actions and decisions governed by more than one set of rules, which often depended on circumstances. For some archaeological artefact categories, this has little bearing on their distribution patterns, especially when activities had to be carried out within a certain area. Rune-sticks however are artefacts that can be manufactured anywhere, in any kind of situation, and discarded the moment after they are carved. There is no reason to assume that those capable of carving runes would have reserved their skills for "special occasions". It is unlikely that the average Bjǫrgvin citizen carved inscriptions like INS478 (page 129),

Idionym	Tags
Búi	owner's tag, trade
Didrik	owner's tag, PN, trade
Eldjarn/ Eldiárn	owner's tag, trade
Glúmr	prayer, quote
Gunnsteinn	følgeseddel, letter, unfinished
Ími	bad, incantation, magic, poetry
Mat(t)heus	ambiguous, christian, incantation
Ragnarr	owner's tag, trade
Þórhallr	owner's tag, PN, trade

Table 32. *Icelandic low-status idionyms and the tags they are connected to.*

but then, only a few were part of these political spheres. The question is therefore one of access, also to Latin/continental poetry. The native Eddic and Skaldic verses could well have been known to large parts of the population. At the present stage of scholarship, too little is known for definite statements.

Returning to the topic of idionyms and text tags, the idionyms connected to *incantation, magic* and similar tags are almost all foreign. In the current corpus, most of them appear only as invocations, tying in with the reservations already discussed (pages 118 to 120). On the whole, most IH-idionyms appear in inscriptions or on objects connected to trade, supporting previous statements about Bjǫrgvin being an important port specifically for Icelanders.

6.3.2 Low-status Icelandic idionyms

Fewer IL-idionyms are connected to fewer tags: *ambiguous, bad, christian, følgeseddel, incantation, letter, magic, owner's tag, PN, poetry, prayer, quote, trade, unfinished* (Table 32).

Within this smaller group, there is more of a balance between different types of inscriptions (perhaps owing in part to lacking interpretations of the remaining inscriptions). Disregarding the complications of some idionyms being different normalisations of the same character sequence, just over half of the idionyms are connected to trade, while the others are tagged either *prayer, incantation, magic* or *poetry*, apart from *Gunnsteinn,* tagged as *følgeseddel/unfinished letter*. In terms of the religious/magic inscriptions, *Mat(t)heus* refers to an evangelist/apostle, the other probably represents a heathen reference to an ill-willed spirit, *Ími*.

Despite inscriptions of another nature tied to IL-idionyms, potential Icelanders of potentially low social status were apparently taking part in trading activities in Bjǫrgvin; that there are fewer of these idionyms may well be because they could afford travelling on fewer occasions than wealthier Icelanders. The caveats established in Section 5.7.1 apply, but even so the result fits expected patterns. A more interesting picture emerges when looking at tags connected to IH- as opposed to IL-idionyms (Query C.44): *bad, følgeseddel* are connected only to IL-, whereas *amulet, balance sheet, carver formula, comment, not interpretable, period context, pub environment, religious, teaching, writing exercise* are only connected to IH-idionyms. However, the latter group contains more idionyms and also more inscriptions (Table 21, page 113), so to a certain extent, the deviation in tags also does not mean anything; that an inscription containing an IL-idionym has a negative content/meaning (bad) can hardly be interpreted such that people carrying IH-idionyms never had any bad experiences or ill-intent (the inscription in question being the same carrying *Ími*, INS328).

Følgeseddel, balance sheet are connected to trading activities and these are attested for IH in the form of owner's tags, so the activities these inscriptions imply overlap. The same rationale can be applied to *amulet, religious*, which can be roughly equated to *prayer, incantation*; they are not the same thing, but the purpose aligns enough for them to be expressions of the same intent.

Not interpretable has no consequence for this comparison. *Carver formula, comment, period context, pub environment, teaching* and *writing exercise,* though, are interesting deviations. *Carver formula, teaching, writing exercise* appear to imply some sort of learning/teaching activities, although proper evaluation of whether this implies differences in the activities Icelanders partook in when in Bjǫrgvin as opposed to Norwegians would require a thorough evaluation of every single inscription and a sound

Idionym	Tags
Ása (f)	learned, love, mnemo-device, poetry, quote
Bárðr	balance sheet, trade
Eiríkr	comment, owner's tag, PN, trade
Eysteinn	owner's tag, trade
Eyvindr	owner's tag, PN, trade
Halldórr	owner's tag, trade
Haraldr	prayer, quote
Helga (f)	følgeseddel, not interpretable, trade
Helgi	følgeseddel, not interpretable, trade
Ívarr	owner's tag, trade
Karl	owner's tag, PN, trade
Klémetr	amulet, christian, incantation, magic
Lafranz	amulet, christian, incantation, magic
Nikulás/Nikolás	amulet, christian, incantation, magic
Ǫgmundr	følgeseddel, not interpretable, owner's tag, PN, trade
Ólafr	amulet, christian, comment, incantation, letter, magic, owner's tag, period context, PN, quote, regular
Pétr	amulet, christian, incantation, magic
Sigurðr	comment, learned, letter, owner's tag, period context, PN, poetry, prayer, quote, trade
Þólfr	owner's tag, trade
Þóraldr	owner's tag, PN, trade
Þorbjǫrn	owner's tag, trade
Þorgils/Þorgísl	owner's tag, prayer, quote, trade
Þórir	not interpretable, owner's tag, trade
Þorkell	følgeseddel, owner's tag, trade
Þorsteinn	owner's tag, PN, trade

Table 33. *Norwegian high-status idionyms and the tags they are connected to.*

argument concerning the geographic origin of the name-bearer in question. That IH-idionyms appear in contexts relating to historical events and, possibly, local entertainment establishments, is also worthy of investigation in the future. This study, looking at general trends in the material, is not the right place for this.

Without the in-depth evaluation of the inscriptions in question, though, these deviations are merely potential indications of different activity patterns and/or the use of runes for different purposes by potentially Icelandic name-bearers.

6.3.3 High-status Norwegian idionyms

Fewer NH-idionyms are connected to tags than in IH (20:22), surprising since both groups contain 51 idionyms (Table 33). On the other hand, there is one, potentially two (depending on which normalisation is correct) feminine idionyms in this group. One case of *Ása* (page 180) appears in connection with *learned, love, mnemo-device, poetry, quote,* suggesting that the inscription does not refer to a real person; if it does, the woman in question is the object of admiration. The other feminine idionym is *Helga,* connected to trade in an inscription that was apparently hard to pin down for scholars, hence the additional *not interpretable*-tag. If the normalisation was secure, this would be evidence that women were part of trading ventures; with the normalisation insecure, a question mark has to remain attached.

Masculine idionyms list the following tags: *amulet, balance sheet, christian, comment, følgeseddel, incantation, learned, letter, love, magic, mnemo-device, not interpretable, owner's tag, period context, PN, poetry, prayer, quote, regular, trade*.

Compared to the tag list for IH-idionyms, seven tags are missing (*carver formula, religious, teaching, writing exercise, ambiguous, unfinished, pub environment*; Query C.44), while *ambiguous, unfinished* cannot be considered as indicating meaningful deviations. Conversely, IH-idionyms do not appear in conjunction with *regular, learned, følgeseddel, love, mnemo-device*, and the list also appears more balanced in terms of how the tags are spread out across the idionyms. The impression is deceiving, though; 18 of 22 IH-idionyms connect to owner's tag, 16 of 20 NH-idionyms do so, too, meaning around 31-35% of each group appear in conjunction with owner's tag, using 51 as the basis. More interestingly, no NH-idionyms refer to leisure activities, which appears strange. Then again, inscriptions not containing idionyms could have been carved by anyone, although Query C.45 shows that only inscriptions also carrying an idionym were tagged, although 93 inscriptions with idionyms remain untagged.

Despite different tags being used, the activities they indicate mostly correspond between IH and NH. *Teaching, writing exercise* can be linked with *mnemo-device*, the broader complex of acquiring/mastering/using new skill-sets, whether that is the skill of carving runes or remembering quotes from canonical literature or prayers. *Learned, regular* are scholarly judgements on the mastery of a specific skill-set, which do not necessarily mirror a contemporary's opinion. The use of these particular tags is also so sporadic that they cannot influence conclusions.

The tag *religious* is clearly represented in the NH-group considering how many incantations there are; it was just not added to any of the inscriptions in question, because it was not used in the literature. A similar argument applies to *følgeseddel;* there are enough NH-idionyms tagged *trade* to render this particular deviation unimportant. The only real difference between those two groups in terms of tags is therefore the *carver formula* in IH and *love* in NH, but it is hard to find any convincing explanation as to why these two groups should differ there except chance.

Idionym	Tags
Bergsveinn	owner's tag, PN, trade
Ótto	letter, trade
Þóraldi	owner's tag, PN, trade

Table 34. *Norwegian low-status idionyms and the tags they are connected to.*

6.3.4 Low-status Norwegian idionyms

Only three idionyms from NL are tagged, one of which could be an NH-idionym (Table 34). Consequently, there are only four tags: *letter, owner's tag, PN, trade*.

Ótto is a foreign idionym, most likely of German origin, so the name-bearer could potentially be a foreigner, although the quartile indicates that the idionym may also have been used amongst the Norwegian population.

All three idionyms are connected to inscriptions referencing trade, indicating that men carrying NL-idionyms were likely in Bjǫrgvin for trading purposes. This is expected, although it is important to remember that this picture may be influenced by the comparatively low number of tagged inscriptions. Interestingly, more inscriptions carrying IL-idionyms were tagged. They also show a wider variety of tags, although that is restricted to prayers, incantations and inscriptions with supposedly magical purposes, which might be owing to how idionyms with Christian/heathen connotations distribute (there are none in NL, Table 23, page 117).

When comparing NH to NL, a much wider variety of tags is connected to NH. *Balance sheet, comment, følgeseddel* can be considered as overlapping with the broader activities connected to trade, but *amulet, christian, incantation, magic, prayer* all hint, again, at some sort of spiritual use of runes that is not, at present, visible in the group of NL-idionyms. *Learned, mnemo-device, period context, po-*

Idionym	Tags
Andreas/Andrés	amulet, christian, incantation, magic
Guðmundr	owner's tag, trade
Guðþormr	sex
Heinrekr	balance sheet, owner's tag, PN, trade
Ingibjǫrg/Ingibiǫrg (f)	comment, pub environment, smut
Ingjaldr/Ingialdr	owner's tag, trade
Ió(h)an/Jó(h)an	learned, letter, owner's tag, period context, PN, trade
Jón	amulet, incantation, letter, period context, prayer, quote, regular, sex, unfinished
Magnús	prayer, quote
Margrét(a) (f)	christian, incantation, magic, not interpretable, quote
Sigríðr (f)	owner's tag, trade
Þormóðr	owner's tag, PN, trade

Table 35. *Pan-Scandinavian high-status idionyms and the tags they are connected to.*

etry, quote and *regular* could be taken as evidence that the supposed social status of these idionyms indeed corresponds with their carriers real-life social status. Then their rune-carving activities would mirror their ability to acquire certain skills as well as their application of said skills in daily life and their involvement with politics.

While I would not entirely discount that this is indeed the case, I would like to point out how few NL-idionyms were tagged and how haphazard the tagging is at times. The validity of this observation remains to be supported by further investigation of the single inscription as well as of more inscriptions from the same corpus.

6.3.5 High-status pan-Scandinavian idionyms

Three feminine PSH-idionym are connected to tags (Table 35): *Ingibjǫrg/Ingibiǫrg, Margrét(a), Sigríðr*. *Margrét(a),* occurring in an inscription tagged *christian, incantation, magic, not interpretable, quote,* is most likely an invocation. However, *Ingibjǫrg/Ingibiǫrg* is mentioned in an inscription tagged as *comment, pub environment, smut,* which begs the question of whether the lady really is of high social status. Additionally, she probably did not live in Bjǫrgvin; the inscription translates "I loved Ingibjǫrg while I was in Stavanger" (INS438). Yet *Sigríðr* is connected to trade, so she may have been a local.

The list of tags connected to inscriptions also carrying PSH-idionyms is fairly long: *amulet, balance sheet, christian, comment, incantation, learned, letter, magic, not interpretable, owner's tag, period context, PN, prayer, pub environment, quote, regular, sex, smut, trade, unfinished*.

While NH lacks *pub environment, smut, sex, unfinished* when compared to PSH, IH lacks *learned, regular, smut, sex*. The other way around, PSH is not tagged with *følgeseddel, love, mnemo-device, poetry* when compared to NH, and *ambiguous, carver formula, poetry, religious, teaching, writing exercise* when compared to IH.

Looking at Tables 31 and 33, those carrying PSH-idionyms appear to have been less interested in trade, but this is an impression based on the distribution of tags, not a statistically verified conclusion. The PSH-group still covers the same activities that the other high-status-idionyms show: runes are used for the purposes of conducting trade (*balance sheet, owner's tag, trade), protection/magic (amulet, christian, incantation, magic, prayer, quote*), communication in general (*comment, letter*) and for political matters (*period context*), entertainment (*pub environment, sex, smut*). Some of them were potentially fashioned by well- or moderately-educated carvers.

These idionyms, by nature of being pan-Scandinavian, cannot be used to (however tenu-

Idionym	Tags
Einarr	owner's tag, trade
Lukas	ambiguous, christian, incantation
Vébrandr	owner's tag, trade
Þorkatla (f)	owner's tag, trade

Table 36. *Pan-Scandinavian low-status idionyms and the tags they are connected to.*

ously) establish geographic origin of rune-carver. It is no surprise either that the tags overlap with the other two high-status groups and provide further evidence that the use of runes between the three high-status groups was similar.

6.3.6 Low-status pan-Scandinavian idionyms

Only four PSL-idionyms were tagged with *ambiguous, christian, incantation, owner's tag, trade*. One of them, provided the identification is right, is feminine: *Þorkatla*. If the identification is correct, this inscription would count as further evidence that women were engaged in trading activities in Bjǫrgvin, much like *Sigríðr* (PSH).

Lukas only appears as an invocation in connection with an incantation, so it cannot be considered as an expression of a person of lower social status using runes for protective purposes, at least not based on the idionym. The inscription may yet have been carved by someone of lower social status, but the idionym itself cannot be used as evidence for the carver's potential social status. It appears that much like the NL-name-bearers, PSL-name-bearers used runes for purposes of trading and not much else, which not only deviates strongly from the areas of use the high-status-idionyms from all three groups imply, but also from IL, which shows by far the broadest range of tags of all the low-status groups. It thus appears as if the use of runes within the group of IL-idionyms is, in fact, closer to how runes were used by those carrying high-status-idionyms, although there is, at present, no readily available explanation why.

6.3.7 Non-status-asssociated idionyms

While the group of non-status-associated idionyms cannot be used for the purpose of determining what people from (potentially) different strata of the social hierarchy used runes for, it would nevertheless be remiss not to list the tags these idionyms are associated with, especially as the range is very broad: *ambiguous, amulet, bad, balance sheet, carver formula, christian, comment, følgeseddel, incantation, instruction, learned, letter, list, liturgy, love, magic, mnemo-device, not interpretable, owner's tag, period context, PN, poetry, prayer, pub environment, quote, references, regular, religious, teaching, trade, unfinished, writing exercise*.

Non-status-associated idionyms are connected to 32 tags (of 41 tags in total), although considering that this group counts 114 idionyms, opposed to the 129 status-associated ones, the large number of associated tags is not surprising. Non-status-associated idionyms can also not be broken down into smaller sub-categories like the status-associated ones. If it were possible to associate them with social status, these idionyms could both contradict or support the observations presented so far. The picture that emerges at present looks as if those carrying high-status-idionyms made much more broad use of runes as a writing medium than those carrying low-status-idionyms, with the exception of IL. Taking into account that some of the non-status-associated idionyms may actually be proper representatives of names given to lower-class Scandinavians of whichever origin, there is great potential here for further research.

6.4 Tags and names

Regarding how the Bryggen inscriptions appear to have changed the view on runes as a script, including by whom and for which purposes it was used (Section 6.1), the main questions are:

1. Are there recognisable patterns in the tags across the six groups of status-associated idionyms hinting at activities mainly carried out by actors with a high/low social status, and if so, which?
2. How do status-associated idionyms relate to inscriptions containing knowledge supposedly only available to a certain group of people, like continental poetry?
3. Can the merchant community be identified as a driving force behind the use of runes in

Tag	IH	IL	NH	NL	PSH	PSL	Feminine
ambiguous	x	x				x	x
amulet	x		x		x		x
bad		x					
balance sheet	x		x		x		
carver formula	x						
christian	x	x	x		x	x	x
comment	x		x		x		x
følgeseddel		x	x				x
incantation	x	x	x		x	x	x
learned			x		x		x
letter	x	x	x	x	x		x
list							x
love			x				x
magic	x	x	x		x		x
mnemo-device			x				x
not interpretable	x		x		x		x
ownership tag	x	x	x	x	x	x	x
period context	x		x		x		
personal name	x	x	x	x	x		x
poetry	x	x	x				x
prayer	x	x	x		x		x
pub environment	x				x		x
quote	x	x	x		x		x
references							x
regular			x		x		
religious	x						x
sex					x		
smut					x		x
teaching	x						x
trade	x	x	x	x	x	x	x
unfinished	x	x			x		
writing exercise	x						x

Table 37. *Overview over which idionyms are connected to which tags, sorted by social status-association.*

Bjǫrgvin?

Before discussing these questions, some words of caution regarding the conclusions presented here: the current status-association of idionyms is by no means as certain as one would wish (Chapter 5); combining it with the text tags was an experiment to determine whether the approach would work for a larger corpus. Also, idionyms sorting into different groups appear on one and the same object, often also in the same text, meaning that the idionyms will be connected to the same tags. While possible from a technological point of view, analysing the combination of text (as an entity represented in TEXTS), tags and idionyms was not possible considering the number of inscriptions and time restrictions. Such fine-grained re-analysis has to be based on a better-developed tagging system and also a better, more detailed basis concerning idionym distribution across time and space in the diplomataria.

Apart from these methodological concerns, another aspect to take into account is the runologist. Since determining the Sitz im Leben of an inscription is very often the goal of interpreting a runic inscription, the evaluations entered into TAKERUN may already be based on the scholar in question having taken the idionym under consideration and thus basing their evaluation of the inscription at least in part on its presumed social status. This presumed social status may contradict the results of the onomastic analysis presented here, skewing the picture. This can only be determined on a case-by-case basis by consulting the literature. The survey is also influenced by some inscriptions having drawn more attention than others, or not being covered in the publications included in the experiment.

All that said, how much potential does a survey like this have in terms of gleaning more information about the rune-carving population of a medieval town? Even taking into account difficulties like the smaller numbers of low-status idionyms in all three groups, one glance at Tables 31 to 36 shows that there are discernible patterns; the question is merely how reliable they are considering the disproportionate representation of low-status idionyms. It is plainly obvious that the high-status idionyms are connected to more tags indicating a broader range of activities than the low-status idionyms, including trade, scholarly activities (teaching, memorising, practising rune-carving skills), political machinations and entertainment of varying kinds. At present, the latter activities are not evidenced in the tags connected to low-status idionyms. They do not appear in connection with tags suggesting familiarity with learned literature and/or continental poetry, neither do they appear in connection with Scandinavian poetry.

Theoretically, this could be considered the answer to the first and second questions. However, the idionyms from the high-status groups appearing in such inscriptions are generally used as invocation and can therefore not serve as an indicator for the social status of the carver, whose name often does not even appear. Additionally, the presence of the tags in question in the group of non-status-associated idionyms implies that the picture might well change once further research into the potential social status of these has been conducted; that people from the lower social scales also engaged in the same activities can therefore neither be ruled out nor confirmed. Without the name of the rune-carver, nothing can be inferred about their social status and, consequently, their access or lack thereof to certain kinds of knowledge. This is important to keep in mind – without potential evidence in the form of the carver's name, especially typically Scandinavian poetry may well have been carved by a person today's scholars would not consider learned.

The observable patterns at present also imply that mainly men from the upper social circles amused themselves by carving "unorthodox" inscriptions; but it is difficult to say for sure. Anyone can carve a high-status idionym, it need not be their own name. In TAKERUN, it is possible to use "interlocutor/invocation" to distinguish between these two groups; yet *Ingibjǫrg/Ingibiǫrg,* for example, is marked as an interlocutor. Still, she is (probably) not the carver in this case, but the subject of the inscription, and this illustrates a further need to specify the information at present collected in TAKERUN to also account for these circumstances.

One difficulty I continued to encounter was the at times unsystematic way in which information on single inscriptions was presented, even within the same publication (this included no inventory number being provided, or no reference to the original transrunification/transliteration). The issue was not much present in the onomastic part of TAKERUN, but in the text section, it very much made itself known in various instances. For example, on several occasions the question of who actually carved the inscription does not even come up, with the previously discussed INS470 being an exception (page 128). But what of, for example, an equally famous inscription, reading "Gyða tells you to go home" (INS269, not tagged in the present survey)? Was Gyða carver and sender, and if so, why did she refer to herself by her name? Or was the message carved by someone else doing her a favour? In the latter case, any evaluation of the rune-carver's skill refers to the actual carver, not the sender of the message.

The problem is not so much that these questions are not discussed, it is that they are discussed in an unsystematic fashion, rendering data normalisation for use in an RDBMS difficult. For a tagging system to work and return useful results, it is imperative that such metadata is added in a systematic fashion and for every single inscription, otherwise the usefulness is highly restricted. Yet this survey shows that making use of tagging could have immense benefits for runologists, for it enables tracing one activity attested across all seven groups, said activity being trade.

Technically, this is hardly surprising in a port like Bjǫrgvin. Yet the fact that trade apparently was a major reason to make use of runes across a large part of the social spectrum and both genders implies not only that a fair proportion of Bjǫrgvin's population was involved in trading activities, but also that Liestøl (1973: 138) could be right in suspecting that trade and the ability to partake in trade might actually have been a driving factor in acquiring at least basic knowledge of runes. Johnsen (1987: 725, 736-38) even takes a step further and suggests that runes could have been the usual medium of communication between merchants already since the Elder fuþark. Liestøl (1973: 137) first mentioned the potential presence of writing schools in Bjǫrgvin, which certainly appears possible considering the inscriptions potentially related to teaching activities.

If trade were a driving force in making use of runes, what does it then mean that so many potential high-status idionyms appear in these inscriptions? Could the Bergen inscriptions be evidence for the emergence of a merchant class in Norwegian society, one that gained enough wealth and influence that their idionyms then also appear frequently in the diplomas? The social mobility of merchants and their families, which increasingly allows them to not only gain monetary wealth, but also landed property (for example Loveluck 2013: chapters 12-14; Carocci 2011), results in them also being part of the transactions many of the diplomas attest, which in turn presents a plausible explanation for why their idionyms appear in runic inscriptions and diplomas, and appear with high frequencies in the latter.

However, based on the current state of affairs and especially the lack of studies concerning the frequency of certain idionyms at different points in time in Norway, this must necessarily remain a hypothesis. Much more fine-grained and detailed analyses of the single idionym, its spread over time and space and a thorough evaluation of the name-bearers' background based on the diploma evidence would be required to draw any conclusion. The overlap of tags between IL and the high-status groups, as opposed to the NH-/PSH-groups, could perhaps be considered evidence for a gain in social prestige, and thus, a focus on a broader range of activities on the part of the potentially low-status Icelandic name-bearers. But again, it would be of crucial importance for this group in particular to consider each idionym and its bearers by itself, since the grouping may already be based on skewed evidence (Chapter 5).

Still, the possibility that the high-status groups already include formerly low-status idionyms which, owing to the gain in social and political power of merchants, are in this study considered high-status idionyms, should not be overlooked. Conversely, it should not be forgotten that the aristocracy started taking an interest in business ventures as well during the time Bjǫrgvin was developing into a town (Loveluck 2013: chapter 13; Johnsen 1987: 726). At the present stage, and without an in-depth analysis of every inscription and idionym, it would therefore be premature to conclude with certainty that runes were used *mainly* by merchants in Bjǫrgvin, and assume that high-status-association of several idionyms indicates that their bearers had attained a fairly high social status based on their trade. It is more apt to state that there is a probability that certain idionyms attested in the Bergen runic inscriptions appear frequently in the diplomataria on account of the merchant families using them having gained enough wealth and power to use diplomas. Unfortunately, owing to the lack of diachronic studies of idionyms in the diplomas, there is no way to pinpoint to which idionyms this could apply, and in the end, more research is required to tackle this question.

The experiment with including Sitz im Leben can nevertheless be considered a success, because patterns become visible by using this combined onomastic-qualitative approach, which previously would not have been readily apparent. The potential to gain more knowledge on a broader scale is thus definitely there. Still, the experiment also shows that using this particular approach for comparative studies has inherent difficulties, not least owing to the switch from physical to abstract entities. The point of incorporating a tagging system into a runic DB is rooted in the possibility of accessing the corpus from a completely different angle that does not require the scholar already knowing which specific words or phrases they are looking for – which, considering the differing customs of transrunifying, transliterating and normalising runic inscriptions, is almost certainly bound to result in incomplete record sets being returned anyway. Instead, it offers the opportunity to search for inscriptions by type, topic or even level of runic literacy if so desired.

One main problem remains; establishing a tagging system which properly mirrors and encompasses the different conclusions scholars can reach while still remaining clear enough to not confuse the user. If this or a similar system were to be applied to a larger corpus than the Bryggen inscriptions, it would require intense study of the different classification systems other scholars have used regarding their corpora of runic inscriptions.

The other main problem already mentioned is the availability of tags for each inscription. That more than half of the corpus is untagged due to lack of scholarly attention, is an annoyance; unrewarding as the tag “not interpretable” may be, it would still be preferable to be able to attach it. Perhaps the incentive of being able to use what would be a fairly convenient system of finding and grouping runic inscriptions for corpus analyses can help to rekindle interest in the unpublished and uninterpreted inscriptions from Bryggen.

7 Archaeological analysis

While runic inscriptions can provide onomastic and literary evidence, archaeology also plays an important role in their interpretation. The Bryggen inscriptions were discovered during excavations in the old medieval/Hanseatic quarter of the town and are as such also archaeological evidence for the development of the town landscape. Its shape was influenced by people from different levels of society. Historians and archaeologists more or less agree these days that while there may have been some kind of pre-town settlement in the area around the bay Vågen, it was most likely at the initiative of a king that the area was parcelled up into plots in the 11th century, although the identity of said king is disputed (see about the history of the debate Hansen 2005a: 15-16; the identity of the king Hansen 2005a: 230-231, 2015a: 186-188).

These plots were then likely given to his followers with the expectation that they would settle there and develop their plots, although activity traces on the plots remain sporadic until at least 1120 and it takes until approximately 1170 for most of the plots being in regular use (for example Hansen 2015a: 194). Only the areas closest to the waterfront appear to have been built up from the start, meaning that the royal initiator(s) were apparently not particularly successful in enticing people to develop the town until the first half of the 13th century, when there is also major building activity of churches in Bjǫrgvin, perhaps connected to the Civil Wars (Hansen 2015a: 188, 191, 194). This stage also sees the first appearances of international trading contacts and finds indicating the presence of artisans and service trades in town (Hansen 2015a: 192, 194-195).

Bjǫrgvin was built as a result of interplay between bottom-up and top-down initiatives taking place (Hansen 2005a), with various actors being involved in different ways, including women and children (Hansen 2006, 2010; Mygland 2007, 2023), craftspeople, fishermen, traders and more (Hansen 2015b,c, 2016; Øye 1988; Larsen 1992). They and their needs and requirements resulted in a town landscape both stable and mutable (Herteig 1985, 1990, 1991).

7.1 Town development in spatial terms

The earliest traces of settlement recorded all come from the northern shore of Vågen (literally "the bay"), one part of the fjord around which the town clusters. It is protected from harsh weather and storms out at sea by a chain of islands called Øygården. That and the original sloping banks made the inner area of the fjord an ideal natural harbour in prehistoric times. Once the settlement started to grow, the natural shoreline confined building space. Excavations showed that it was pushed further into the harbour basin by building caissons (bolverkskar) at the waterline and further out into the deeper bay areas. This waterfront expansion seems to have been of great importance to those living on/owning plots in Bjǫrgvin throughout the whole medieval period. Its extension appears to have been a continuous process helped along by debris from fires and other waste being used to fill the substructures upon which the new houses rested. At the same time, the waterfront expansion follows the already existing structure of plots (Herteig 1985, 1990, 1991).

The BRM 0-site is located on the northern Vågen shore, in the northernmost part of the town-area called "Bryggen" today. This area was divided into oblong plots during the initial stages of town development, running perpendicular to the shoreline and still observed today in building patterns (Hansen 2005a). A back, middle and waterfront area can be identified along horizontal lines; since the waterfront is pushed further out into the bay over time, areas that are waterfront in one period can be part of the middle in a later one. The structures on the plots were mainly identified as buildings and/or storage rooms (if not support structures), which can form small groups making up one household, although it is very difficult to determine which buildings may have belonged to the same household. Their layout on the plots follows a strict pattern; two rows of houses are built along a passage leading down to the harbour, with their backs touching the backs of the houses in the neighbouring house row. House rows as well as passages are named, with several of the names known from historical sources, although it is not always quite certain where the passage in question was located (for an extensive discussion, consult Helle 1982: 183-246, 274-304).

This characteristic double-house row pattern is the physical reality that townspeople experienced on a daily basis and appears to have been fairly consistent along Vågen's northern shore. The bulk of finds and most of the observations on structures originate from the BRM 0-site, the northernmost part of the town area, not counting the half-island Holmen with the king's residence. The four house rows making up the area are called Bugården, Engelgården, Søstergården and Gullskoen, with the last taking up about as much space as the other three rows together due to its curious layout (Herteig 1985: 11). The other three rows show the double-house row pattern, meaning that a passage is bracketed by two rows of houses/storage rooms, with the waterfront areas probably serving as the quay and belonging to the same people who also owned the houses (Norwegian "gård", referring to a household unit rather than a single building). Determining the exact ownership of a single house-/gård, though, is impossible even with the help of historical sources, although it is known from the times of the Hanse that the properties on one plot could belong to several different people. Presumably that was also the case in the earlier stages of town development (Helle 1982: 274-303; Ersland 1994).

Although BRM 0 can theoretically be divided up into smaller areas (plots or houses), the difficulties in determining plot boundaries and also houses would have warranted more in-depth examination than was possible here. The site is therefore considered as a whole, with the only distinction being how close objects were to the waterfront area.

7.2 The legacy of the Bryggen excavations: normalising old data

Another complicating factor is the sheer volume of material BRM 0 produced (over 300,000 finds); various parts and aspects of the excavation are therefore still being published. The most important tool for these analyses is a DB maintained by Universitetsmuseet Bergen, which was recently included in the nation-wide MUSIT-DB. It is possibly one of the oldest Norwegian archaeological DB in existence, although it underwent several software changes and revisions since its conception (Herteig 1985: 33-46; Hansen, Hope & Mygland 2017). As per February 2017, the DB consisted of two tables called Altbase and Kontekstbase. The first entity type contains every single find discovered in the course of BRM 0 and subsequent excavations; the second entity type, linked to the first by the *Linjenummer*, the context PK, lists all individual contexts (Hansen, Hope & Mygland 2017). Kontekstbase must be considered as representing an archaeological context in the broadest sense possible, including information about layer type as well as nearby structures, coordinates etc., while Altbase focuses on the objects themselves, but also contains information one would not necessarily expect in this entity type, such as transliterations (see Chapter 4 for why this is an issue).

With only two entity types, columns were added as new information needed to be stored, resulting in tables of more than 60 columns. Additionally, several of these columns represent revisions of already existing data, so without intimate knowledge of the DB, it is difficult to extract relevant, up-to-date information. Using the data nowadays is therefore somewhat of a challenge, and for this project, re-modelling the legacy data became necessary to enable better compatibility with TAKERUN's entity model.

7.2.1 *Excavation methodology*

Restructuring the data from the existing DB into new entity types necessitated a closer look at the excavation methodology, since this informed which kind of data was gathered and how it was connected. For example, in 1955 it was decided to use the stratigraphic method in the planned excavations rather than today's single-context-based approach (Herteig 1985: 16). Where BRM 0 is concerned, a "context", called "linje" in the original documentation, therefore describes a bag/assembly of finds excavated in roughly the same area and given a unique number, "linjenummer". This area could consist of less than 1m² or of anything up to a 8x8m-square covering both the inside and outside of a building, the result of a local grid being set up using 8x8m-squares as basic excavation units.

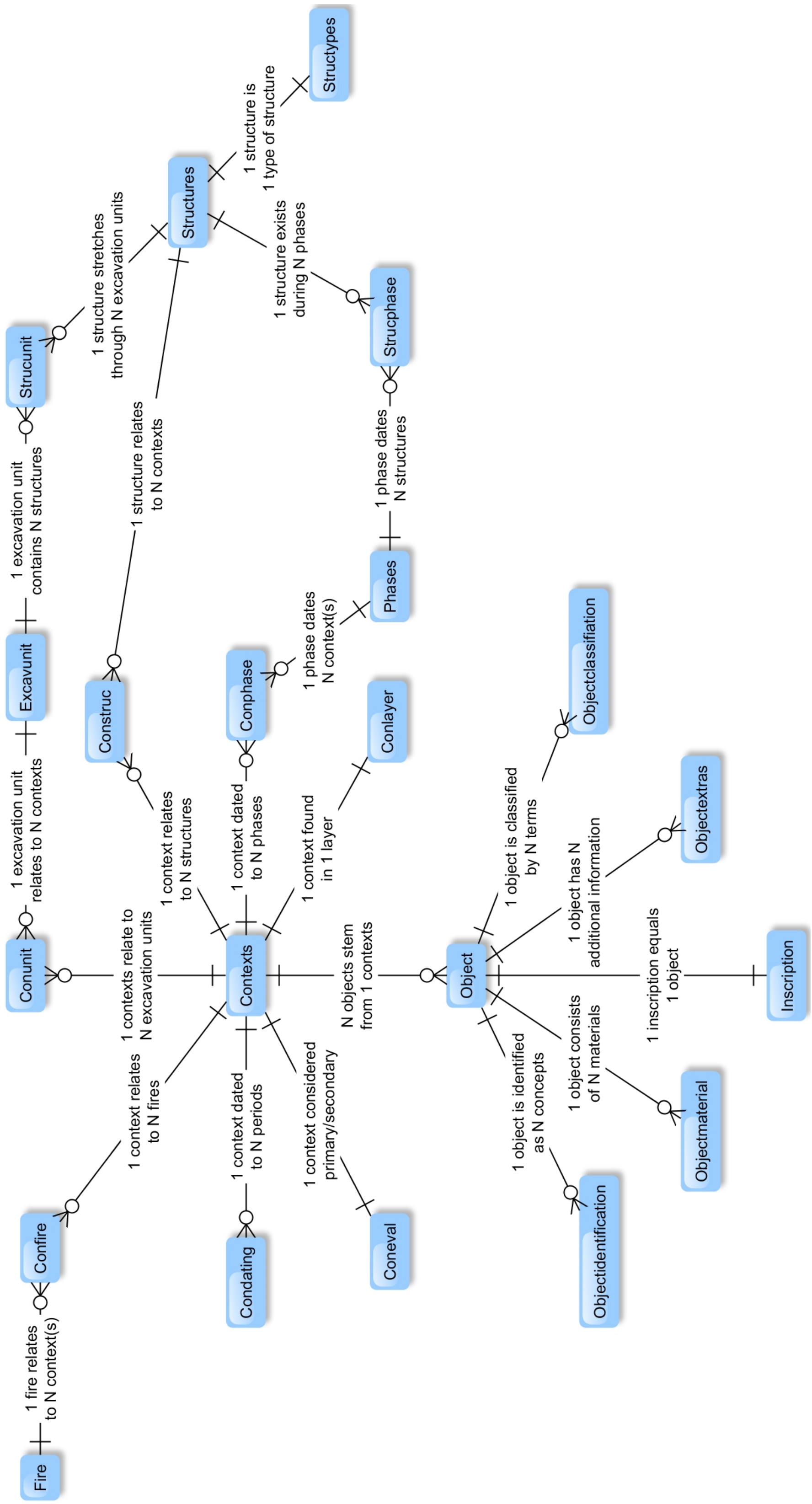


Figure 31. *Entity model of the archaeological part of TAKERUN.*

Column Name	Data Type	Length	PK?	Not Null?
unitid	varchar	5	true	true
northx	int	5	false	true
northy	int	5	false	true
eastx	int	5	false	true
easty	int	5	false	true
southx	int	5	false	true
southy	int	5	false	true
westx	int	5	false	true
westy	int	5	false	true

Table 38. *Table structure* EXCAVUNIT.

A local point 0 served as a reference, based on the observation that an 8x8m square covered approximately the width of one house, meaning that what a modern archaeologist might consider one context – the inside of a house – can, in the UMB DB, be spread across any number of contexts. Determining whether the objects contained in one "linje" actually originate from the same "context" in a strict sense, or from as many different contexts as there are objects, is therefore difficult.

Roman letters designate the x- and Arabic numerals the y-axis of those excavation units, which were also not dug equally; several were dug to a certain level using mechanical diggers, resulting in many potential finds being lost and a generally skewed distribution of finds in different areas of the excavation. Since these units form their own physical reality and serve as references for where a context was excavated, they are an entity type, designated EXCAVUNIT (Table 38, Figure 31); coordinates in the BRM 0-documentation, while available for some "linjenummer" and finds, are the exception rather than the rule. The PK consists of the grid reference (Roman letter/Arabic number), and the table stores the coordinates (measured in metres from local point 0) of all four corners of the excavation unit in question. The following observations help to locate the context/linjenummer in the excavation area and provide more information about its surroundings:

1. excavation unit
2. buildings in its immediate vicinity (distance, relation, type of building)
3. layer (type, colour, relation and distance to layer)
4. fire layer (see Section 7.3)
5. coordinates

This level of detail would provide a solid basis for analyses if the respective cells were not empty for the majority of entries, although fortunately, runic inscriptions were considered very important finds. Information on the layer is therefore available for 197, associated structures are noted for 448 contexts from the original BRM 0-site. 562 have information on the fire layer and 573 out of 577 contexts in total have an associated excavation unit (some have two). However, there are only 143 contexts which have information about all of those (Query C.54, C.53, C.55). Consequently, the excavation unit is therefore the only point of reference for several contexts. It must also be noted here that while runic inscriptions from follow-up excavations to BRM 0 in the Bryggen area were considered part of the corpus in previous chapters, excavation methodology for these later excavations differed, making it difficult to conduct analyses across these different excavations. Since the project was already quite difficult to conduct, a decision was made to postpone using the runic inscriptions from later excavations from the archaeological analysis for now. These inscriptions can easily be recognised by the first four digits in their inventory numbers (Table 73, column "Museum") starting with a combination not 0000.

Houses and other human-made structures often expand across several of the 8x8m-units, and

Column Name	Data Type	Length	PK?	Not Null?
strucno	varchar	5	false	false
structype	varchar	5	false	false
strucid	varchar	10	false	false
strucsource	varchar	30	false	false
strucsourcepg	varchar	10	false	false

Table 39. *Table structure STRUCTURES.*

must be considered their own entity type, stored in STRUCTURES (Table 39, Figure 31). The contents rely largely on a list of all structures published in Herteig (1990, 1991) compiled by Egill Reimers, kindly made available to me by Gitte Hansen. It provides information on the kind of structure, the identifying number, the excavation units it spans, the dating of the structure and literature alongside other references pertaining to the original documentation. Structure type was turned into *structype* while the literature references are stored in *strucsource* and *strucsourcepg*. The identifier was added as well, *strucno*.

Difficulties originating from the legacy data begin showing themselves in this relation. Since not all of the structures were published, not all appear in the list. The remaining structures connected to the inscriptions were added by means of running a query on the relevant columns in the original UMB DB, which results in a PK-issue: in Reimers' list, some structures seem to appear twice and the situation is compounded by adding the structures from the DB. Reimers' list also only offers six different structure types: AV (latrine), BR (well), BY (building), GR (ditch/trench), IL (hearth), KA (substructure), whereas a DISTINCT-query in the original UMB DB returns 62. Deciding whether a structure from the Reimers list corresponds to one from the DB is therefore very difficult and requires in-depth study of the original documentation. Where possible – i.e., where the combination of *strucno* and *structype* was unique – this was used as the PK for the respective building. That still leaves 170 entries in STRUCTURES without a PK and therefore, un-connectable by way of Table 40.

However, structures are connected to contexts via CONSTRUC (Table 41, Figure 31). Other than STRUCTURES, CONSTRUC relies on data from 24 columns in Kontekstbase storing the horizontal and vertical structures in the immediate vicinity of a context, see Figure 32, the boxes labelled "Horisontal" and "Vertikal". Of the originally five slots available, only the first horizontal slot seems to have been used for the large majority of finds, followed by the vertical relation. The other three slots are rarely used. These columns are important for context evaluation (Section 7.2.2). Continued revisions resulted in more columns being added with the same purpose, preserving the original entries in case they were needed at a later point in time. Instead of retaining this data structure, which results in a lot of empty cells, CONSTRUC uses *structype, typsource*, where type of structure and the original column designation are stored; *strucno, nosource* for the structure identifier; *distance, disource* for the distance of the find/context from the structure; and lastly, *relation, relsource* and *reltype* for information about the nature of the connection between find/context and structure (the last column being my addition, marking whether the connection is horizontal or vertical, although that can be inferred by the values in the *source*-columns). The *musitid*-column links back to CONTEXTS, while *strucid* should contain the PK for each structure; for the reasons mentioned above, there is none for many of them at present. Potential revisions of the cell content are dealt with by transferring both the data from the original and the revision columns, including the column designation in *source*. Like this, queries can be run excluding entries from a particular source (either the older version or the newer one), although that this only applies to eight entries to begin with and it is difficult to ascertain whether the additional entries are meant to replace

Column Name	Data Type	Length	PK?	Not Null?
strucid	varchar	10	true	true
unitid	varchar	5	true	true

Table 40. Table structure STRUCUNIT.

Column Name	Data Type	Length	PK?	Not Null?
musitid	varchar	10	false	true
structype	varchar	20	false	false
strucid	varchar	10	false	false
typsource	varchar	10	false	false
strucno	varchar	6	false	false
nosource	varchar	15	false	false
distance	varchar	15	false	false
disource	varchar	10	false	false
relation	varchar	20	false	false
relsource	varchar	10	false	false
reltype	varchar	15	false	false
bibtexkey	varchar	30	false	false

Table 41. Table structure CONSTRUC.

Column Name	Data Type	Length	PK?	Not Null?
musitid	varchar	10	true	true
linjenr	varchar	10	true	true
plannr	varchar	10	false	false
profil	varchar	10	false	false
bilag	varchar	10	false	false
nivnr	varchar	10	false	false
xco	varchar	20	false	false
yco	varchar	20	false	false
zco	varchar	20	false	false
niv	varchar	10	false	false

Table 42. Table structure CONTEXTS.

Column Name	Data Type	Length	PK?	Not Null?
musitid	varchar	10	false	true
unitid	varchar	5	false	true
unitsource	varchar	5	false	false
unitpart	varchar	10	false	false
unitpartsource	varchar	10	false	false

Table 43. Table structure CONUNIT.

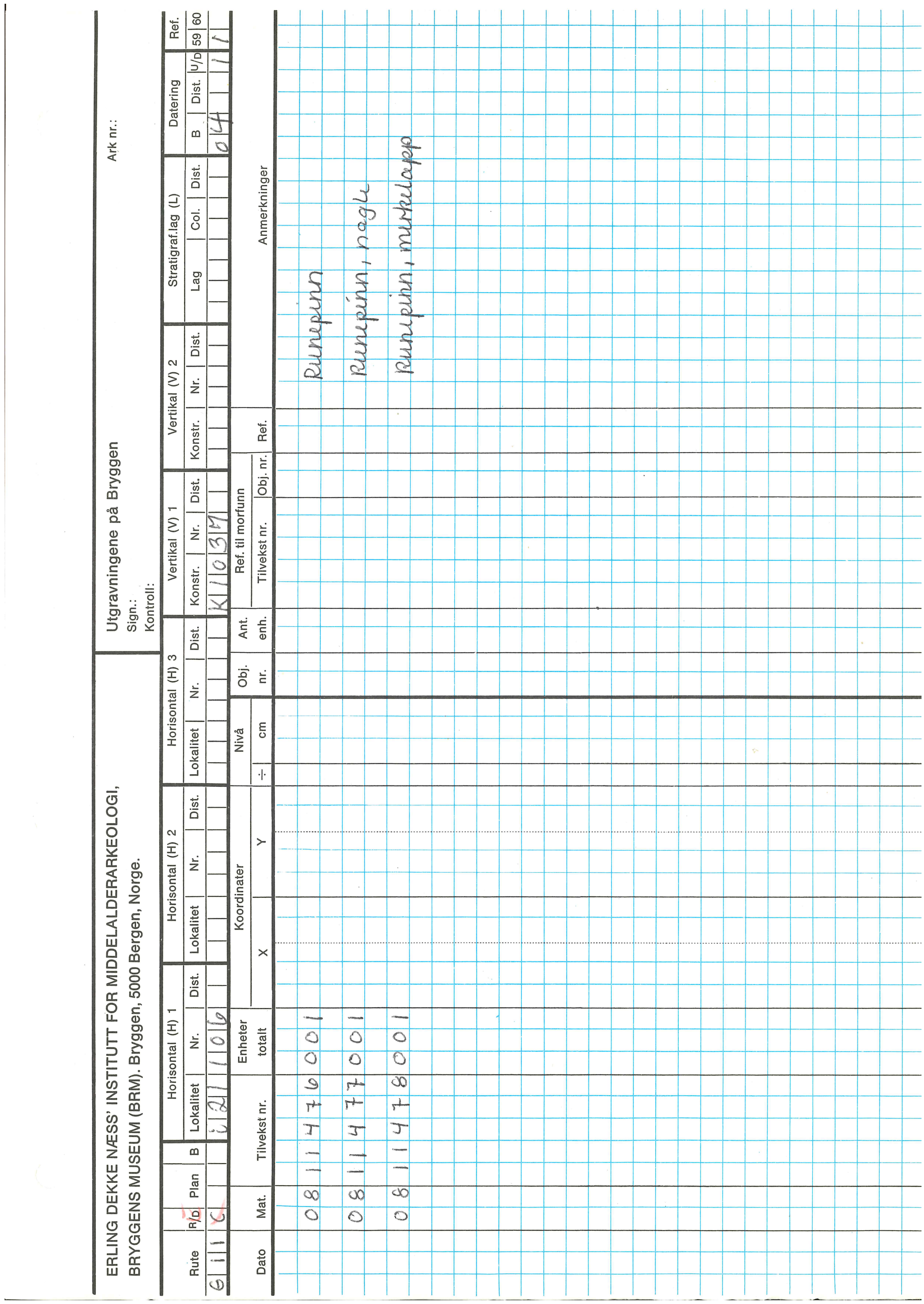


Figure 32. Tilvekstregister.

the data in the original column or were added as additional information. My own examination of the original documentation produced 26 new entries for 22 contexts (Query C.48), all of which were considered in addition to the original data since, to the best of my knowledge, it did not contradict the already existing entries.

CONSTRUC leads to the entity type CONTEXTS (Figure 31, Table 42). With most of the pertinent data moved to other entity types, it only retains 10 columns from the original Kontekstbase. The PK is *musitid,* the unique number assigned to each context during the migration to the national MUSIT-DB rather than the original *linjenummer,* although for backup reasons, this was also kept. Most other columns remaining in CONTEXTS store information about the documentation of the context (*plannr, profil, bilag, nivnr, niv*); they are of no interest to the current study, though, other than as "literature references" to sources consulted in context evaluation. CONTEXTS also stores what coordinates are available for the exact location of each context (in the local grid). Unfortunately, since some of the cells contain values like "32-3600", the coordinate-columns are varchar instead of integer or decimal as they should be. It is also important to note that the coordinates at times contradict the find location suggested by the excavation unit. It frequently turned out to be difficult to determine which piece of information provides the correct location; instead I wrote queries automatically checking whether the x/y-coordinates provided are actually located within the excavation unit in question (Query C.46, C.47). Objects/contexts with a contradiction between coordinates and excavation unit use the coordinates instead of the excavation unit; runic inscriptions were considered so important that their find spots were often measured in and they were even assigned their own context number despite originating from a context yielding more finds (pers. comm. Gitte Hansen). Although they do not always show up in the drawings, it can therefore be assumed that these measurements are correct.

A bespoke JOIN CONUNIT (Table 43) connects CONTEXTS to EXCAVUNIT because in the original Kontekstbase, two columns are designated to associated excavation units, *Rute* and *R2*. While most entries only have values in the first, on occasion the latter also contains data. A JOIN was therefore required, combining the data from said two columns into a compound PK made up of *musitid* and *unitid* with *unitsource* providing the designation of the original column. There is also data available on which part of the excavation unit yielded the context in question, stored in *unitpart*. This additional information in Kontekstbase is stored in two columns adjacent to *Rute, R2* and was therefore also given a *unitpartsource*-column to properly track its origin.

7.2.2 Context evaluation

Contexts/finds from BRM 0 are located first and foremost by means of the excavation unit. Additional information about structures in their vicinity helps establish the broader context of the find circumstances, although the lack of information for many contexts/objects already renders it difficult to decide whether they were found *in situ*. Since the aim of this investigation was to gather more information on the individuals behind the runic inscriptions, the approximate original area of use of a runic inscription would help in determining, for example, in which houses individuals lived (or spent time), not to mention that the many different text types could help in establishing bespoke areas of use within the town landscape. After all, "[i]t is important that we remember that archaeological remains are material traces of *activities* carried out by *people* in the past" (Hansen, Ashby & Baug 2015: 2).

Yet runic inscriptions are often carved into small, easily re-deposited objects (not counting the walrus skull with INS173), and frequently ended up with other debris in layers far from their original area of use; therefore their contexts need to be evaluated carefully. Hansen (2005a: 51) established four categories for the purpose:

1. *In situ* culture layers found in their original and functional context, such as a house floor.
2. Redeposited culture layers, for example objects and rubbish from a plot or property, transported to a close-by area in the process of waste disposal. Although not found in their functional context, they probably still

represent activities that took place nearby.
3. Redeposited culture-layers for example used as fill-masses in construction work.
4. Culture-layers/artefacts redeposited by non-human events like waste dumped into a stream and carried further downstream.

Only the two first categories of culture layers can provide information on the original area of use/purpose, although it is already difficult with the second category. Based only on the results retrieved via Section 7.2.1, context evaluation is difficult, since the basic approach relies on determining the context's relation to structures nearby. This location is described in terms of relations to building/layers, if applicable using compass terms, and either horizontal or vertical. To decide whether a context was relocated, these notes are helpful to an extent only. Where the information says "in structure x", the type may then suggest whether the context was *in situ* or redeposited, for example when objects were found in supporting structures built into the harbour basin to carry the actual houses above sea level. If an object was found in such a substructure, the context is most likely redeposited – these caissons were filled with rubble and often below sea level. Additionally, the relation to any given building only reflects what the excavators could most easily recognise in the immediate vicinity and does in no way imply any actual connection. "In" was not only used when there was a structure present, but also when it had ceased to be visible in the field, but so far no new structure had appeared. In such cases, the correct term would have been "under", but this was not always observed (pers. comm. Gitte Hansen). Vertical relations may add clarity; "in caisson" combined with "between wooden beams" indicates not only that the object was discovered in the caisson, but that it was actually found between traverse beams of said structure. Nevertheless, caissons (especially those at the waterfront) suggest redeposition by default, although deposition of waste materials rarely crosses property/plot boundaries (Hansen 2005a: 48) and the rubble therefore still most likely stems from the plot the substructure also belongs to. These inherent limitations lead to the conclusion that in terms of relations to structures, reliable and uncertain contexts can be characterised by the following criteria:

- reliable
  1. horizontal *and* vertical relation(s) to a structure noted
  2. horizontal location described as *in, under, - part, inside* structure
  3. vertical relation described as *between, in, above, at lower border of* structure
- uncertain
  1. horizontal *or* vertical relation to a structure noted
  2. horizontal relation described as *- of, in, under, by, around, outside, in front of*
  3. vertical relation to structure described as *at same level with, around*

The term *reliable* in this case only signifies that the relation to the structures mirrors actual circumstances. The context may still be redeposited, i.e. if the location happens to be in a caisson, there is more certainty about it being redeposited, as opposed to a context only described as located in a house, which might be *in situ* in nature (i.e. the runic object was actually used there), but the description does not allow for it to be identified with certainty as a reliable context.

Unfortunately, in many cases the structure relations are the only information permitting context evaluation, although Kontekstbase also stores additional information, beginning with which kind of layer an object was found in. The corresponding entity type is CONLAYER (Table 44, Figure 31), built along the same lines as most of the tables in Section 7.2.1, with *musitid* connecting the entries back to CONTEXTS and information on the layer and its relation to the context in question provided in *layertype, layercolour, layerdistance, layerrelation*. The layer type most common for runic objects is, unsurprisingly, "generic fillmasses", i.e. (re)depositions of whatever material was used to even out the ground in advance of building, or filling in caissons. Besides generic fillmasses, there are fillmasses containing twigs, wood shavings and charcoal residue. Contexts found in these layer types, regardless of structure relations, must all be considered redeposited. However, the generally good condition of

Column Name	Data Type	Length	PK?	Not Null?
musitid	varchar	10	false	true
layerid	varchar	5	false	false
layertype	varchar	50	false	false
layercolour	varchar	20	false	false
layerdistance	varchar	10	false	false
layerrelation	varchar	10	false	false
layersource	varchar	30	false	false

Table 44. *Table structure CONLAYER.*

Column Name	Data Type	Length	PK?	Not Null?
musitid	varchar	10	false	false
evaluation	varchar	15	false	false
conevalsource	varchar	30	false	false

Table 45. *Table structure of the structure of CONEVAL.*

most runic inscriptions suggests that they were not redeposited with the fillmasses more than once.[1]

While the data contained in CONUNIT, CONSTRUC and CONLAYER may be termed the "context" of an object, the information differs. A layer type provides information about the immediate surroundings of an object, such as whether it was found between floorboards or in fillmasses. Excavation units and structures in the immediate vicinity, by contrast, define the frame, the physical reality that defines "insides" and "outsides". They form the evidence that defines the context type, i.e. whether it is *in situ* or redeposited. In the very best case, coordinates within the local coordinate system locate the object down to the centimetre in the excavation area, although for most objects, either one or both coordinates will be missing. However, for objects without information about related structures or layers, the coordinates can still provide essential information, particularly the z-coordinate, height above/below sea level. A wooden object discovered at -3m sea level cannot have been used in this area; it must have gotten there by being part of fillmasses dumped into the water (see Hagland 1988a; about the controversy Nedkvitne 1989).

As a last resort in deciding whether a context is redeposited, the original excavation drawings in the museum archives can provide additional information, although they almost never include hints as to the objects found within the layer drawn. While using coordinates would be preferable, an approximate localisation within an 8x8m-square is not too bad a basis to judge whether a context is redeposited or possibly *in situ*. During extended stays at the Universitetsmuseet in 2017 and 2018, I was able to check 498 of 578 contexts relating to 599 objects from BRM 0 with actual or suspected runic inscriptions, and assign a context evaluation to them (Table 45). The values in CONEVAL and the evaluation of a context as primary (in situ) or secondary (redeposited) are based on the information available in the UMB DB and the various parts of the archaeological research database discussed just now. Although not using modern-day excavation methodology, the amount of thought that went into documenting BRM 0 allows for a good number of conclusions to be drawn from the material, including the possibility to fine-date most inscriptions to the various periods of the town.

[1] Since legacy data presented obstacles for data normalisation once more, there is at present no entity type "layer type", although this would have been useful, especially when dealing with special kinds of layer like "fire layer" (Section 7.3).

7.3 The fire chronology and the dating process

As explained in Section 7.6.9, Bjǫrgvin underwent several stages of development, interrupted by fires which destroyed large parts, if not all of the town, even before the 1955-fire. Since king(s) had a vested interest in Bjǫrgvin and it was an important trade port also for other countries, many of these fires are documented in contemporary sources (see Helle 1998: especially for the extent of fires). The ash layers left behind remained in the ground and nowadays help archaeologists to separate periods and establish a relative chronology during every excavation of the older parts of town (Hansen 2005b), providing stratigraphic breaks between different phases of town development and ante-quem-dates for contexts/finds. Yet the "fire chronology" is fraught with problems in terms of fine-dating. To sum up the key points from Herteig (1985, 1990) and Hansen (2005a):

1. A fire layer found on one site does not necessarily originate from a fire noted down in written sources;
2. The written sources may not be as reliable as surmised;
3. In some parts of the excavations, fire layers were cleared very thoroughly before a new building was erected;
4. Unknown local fires (whereas "local" qualifies as one or more houses but not the whole street/plot) may confuse the chronology.

Some of these problems pertain more to the identification of the fire layer in question in the field, whereas others concern the chronology as a whole. The current chronology serving as the framework in this study is presented in Figure 33.

Fire	Date	Period	Building phase	
0	1955			
		9	9.2	
I.a Prev. Unknown			9.1	9.1.1
I	1702			
		8	8.3	
I.b Prev. Unknown			8.2	
Local fire 1527			8.1	8.1.1
II	1476			
		7	7	
III	1413			
		6	6.3	
III.b	1339			
			6.2	6.2.1
			6.1	6.1.1
IV	1332			
		5	5.2	5.2.1
			5.1	
V	1248			
		4	4.2	
			4.1	
VI	1198			
		3	3.2	3.2.1
			3.1	3.1.1
VII	1170/71			
		2	2.2	
			2.1	
VIII	c. 1120			
		1	1.2	
			1.1	
Oldest documented structures at the Bryggen site (BRM 0): 2nd quarter of 11th century (c. 1020/30)				

Figure 33. *Bryggen fire interval chronology. Compilation of dates from Herteig 1990: Fig. 3, 1991: Fig. 5 and Hansen 1998, 2005a: 58-67 (drawing Gitte Hansen).*

In TAKERUN, the entity type storing the relevant data is FIRE (Table 46). It contains only three columns, with *fireid* as the PK, while *fireyear* stores the (approximate) year of the fire and *altfireid* the Roman equivalent of the number stored in *fireid*. Since the start of publication, fires were given Roman numerals, whereas the periods of town development between the fires get Arabic numbers. The sequences also run opposite – the oldest fire layer is designated VIII, whereas the oldest period is labelled 1. Fires VIII and VII therefore bracket period 2, while fire I and 0 mark beginning and end of period 9, which also applies to the other periods. With the ash layers providing physical evidence of ante-quem and post-quem borders, dating the objects in the layers in between is a comparatively easy task. However, fires were not the only reason for changes in Bjǫrgvin's physical layout. As Figure 33 illustrates, some of the longer (and even the comparatively short) periods can be divided further into what are referred to as "building phases" to avoid confusion, often very localised replacements of buildings and structures that for some reason other than a fire were replaced. The phases starting after one fire and ending by destruction via the next, on the other hand, are referred to as periods.

While the fires bracket each period and therefore date its beginning and end, and the fire layers are also used to date contexts (Table 44), they are at the same time dated, at times fine-dated, by period or building phase where circumstances allowed for it (Figure 31). Both methods of dating contexts/objects at the same time yield some complications.

PHASES has five columns, the PK-column *phaseid* (Arabic number with added letter if required), *phasedates* to store start and end dates that do not correspond to fires, and *startfire, stopfire* storing the FK indicating the fires bracketing the periods (but not the building phases). Both FIRE and CONPHASE connect to CONTEXTS via JOINs, CONFIRE and CONPHASE (Tables 48 and 49), which contain much the same columns that can also be found in CONLAYER: *musitid* to connect them to the right context, *firedistance, firerelation, firesource* concerning information about where a context/object was discovered in relation to a fire layer, and *firecom* for additional information regarding the original documentation and whether the fire layer could be clearly identified. CONPHASE, on the other hand, has an added column *uncertain*, which is BOOLEAN and set to 1 if, in the original DB, a question mark was attached to the period.

The two JOINs are required on account of past and future revisions of the data. In the UMB DB, three columns store revisions of the fire layer the objects relate to, and my own survey of the material added another "revision" (although it was restricted to adding missing information from the original documentation). There are likewise two columns for period and my own additions. In short, each context can potentially be connected to a fire layer five, to a period four times, much in the same way the same character sequence can be normalised into one or more idionyms (Section 5.5.4). These revisions were not carried out in a systematic fashion for *all* of the finds; they were re-dated and re-assigned when studies required it. Several runic inscriptions are therefore still dated according to Herteig's initial survey of the documentation. Theoretically, these "old" datings could have been removed in favour of only keeping the new ones. That, however, seemed unwise considering that further investigations might well require the old data to be accessible, if only as references to find the right documentation; using JOINs satisfied both requirements, since, by making use of properly written queries, contexts dated several times can be filtered out and re-evaluated if necessary, or the most recent datings can be retrieved for those objects for which they are available, while the original datings are returned for the other ones. When evaluating a context, two different aspects therefore need to be considered:

Firstly, its status as *in situ* or redeposited.

Secondly, the reliability of the dating.

Objects as small as rune-sticks may have been lost or disposed of at any point within the town landscape, but they were not necessarily likely to stay put. They may have been moved elsewhere quite by coincidence when repairs needed to be carried out within a building or after a fire swept the town. Given the ease with which the objects could be displaced, it is almost impossible to determine whether their contexts reflect the original area of use within one plot or not, but generally it can be assumed that they do not. However, it is also possible that the period they are dated to is not the period during which they were carved; after a fire, the objects may have been swept up during clearing measures and redeposited with the rest of the material. If they are used as part of fillmasses, they may then become part of a layer that postdates their actual period of use. This renders their dating by period somewhat questionable.

On the other hand, dating them by fire layer is not necessarily a better option. Fire layers were referenced in the documentation until the next layer of ash appeared in the stratigraphic record. A lot of contexts are recorded as being found "under" a fire layer, when in fact, they were physically closer to the fire layer below them, which had however not yet been recorded ("over"). Table 50 illustrates why this is a problem. While the fire layers separating periods provide a very convenient means of fine-dating archaeological finds, the fires did not occur in regular intervals, which no doubt the townspeople were more grateful for than the archaeologists. During the longer periods, more objects had the chance to be lost, thrown away

Column Name	Data Type	Length	PK?	Not Null?
fireid	varchar	4	true	true
fireyear	varchar	10	false	false
altfireid	varchar	6	false	false

Table 46. *Table structure FIRE.*

Column Name	Data Type	Length	PK?	Not Null?
phaseid	varchar	5	true	true
phasedates	varchar	15	false	false
startfire	varchar	5	false	false
stopfire	varchar	5	false	false

Table 47. *Table structure PHASES.*

Column Name	Data Type	Length	PK?	Not Null?
musitid	varchar	10	false	true
fireid	varchar	4	false	false
firedistance	varchar	10	false	false
firerelation	varchar	15	false	false
firecom	varchar	150	false	false
firesource	varchar	20	false	false

Table 48. *Table structure of the structure of CONFIRE.*

Column Name	Data Type	Length	PK?	Not Null?
musitid	varchar	10	false	true
conphase	varchar	30	false	true
uncertain	tinyint	1	false	false
phasecom	varchar	15	false	false
phasesource	varchar	30	false	true

Table 49. *Table structure CONPHASE.*

Period	Preceding fire (year)	Succeeding fire (year)	Duration in years	Building phases
2.0	ca. 1120	1170/71	unknown	2
3.0	1170/71	1198	27	2-4
4.0	1198	1248	50	2-4
5.0	1248	1332	84	2-4
6.0	1332	1413	81	3-6
7.0	1413	1476	63	1
8.0	1476	1702	226	2-3

Table 50. *Start and end dates and duration in years of each major period. Note that the 1170/71 fire took place around Christmas; it is therefore uncertain whether it happened in 1170 or in the first days of 1171. For the purposes of calculation, 1171 is used.*

and end up in the archaeological record, yet with no fires "cleaning up" what rubbish had accumulated, one would also expect that more concerted efforts were made to dispose of waste which would otherwise start to inconvenience Bjǫrgvin's inhabitants. That Bjǫrgvin was by no means static in between the fires is also illustrated by the number of building phases per period. Continuous activity required repairing, replacing, tearing down and/or rebuilding old structures while constructing new ones all the time. These activities are sure to have had an impact on object deposition, whether beneficial (when waste was used as fillmasses underneath/in new constructions) or detrimental (when an old structure was torn down and the area cleared for the new one). Since there is a much greater need for replacement of structures during a longer period, object deposition during the longer period has likely been impacted more than during shorter ones, although in which way is hard to determine. This problem of skewed numbers owing to different period-duration is something every scholar working with the material notes, for example Mygland 2007: 45. Whether a context was discovered "over" or "under" a specific ash layer therefore matters, as its exact position would indicate at which stage of the process it was deposited.

Either way of dating the contexts has its own pitfalls and it is often quite difficult to decide, especially when information (such as distance to fire layer) is lacking, although this is less of a problem with actual structures, connected to PHASES via STRUCPHASE. Due to time restrictions, I did not undertake any re-dating of the runic inscriptions, instead focusing on the question of *in situ* or redeposited contexts and relying on the datings provided by the UMB DB and subsequent data revisions. However, since the datings were used in order to analyse whether the composition of townspeople changed over the course of time and whether their use of runes did as well, it is important to be aware of the datings' origin and the uncertainties attached to them. On the whole, it is likely impossible to determine whether an inscription should be dated one period earlier than it was, although in single cases arguments could be made for such a re-dating. While the fire layers are fairly reliable ante-quem-boundaries in some areas, Bjǫrgvin's inhabitants cleaned the area as much as possible, sometimes including the ash layer, to then rebuilt on top of the previous culture layers. Although it seems that they were not much in the habit of removing culture layers much deeper than the ash layer after a fire, these were not thick blankets of ash and sometimes only visible as fire traces on a structure. Excavators may therefore have attributed a "linje" to the wrong stratigraphic layer (pers. comm. Gitte Hansen). The fact that runic inscriptions in most cases are not shown in the original drawings of the excavation, that z-coordinates are just as likely to be missing as not, that there is most often no distance to the fire layer noted down in the documentation, all combine to render reassessment difficult to impossible. There is nothing to be done about this, so while the stratigraphic situation is in some areas clearer than at other excavations, this should not be taken for a given everywhere.

7.4 Archaeological object classifications

While context evaluation is an important part of the process of reconstructing the original function and use of an object, its archaeological classification is also a significant factor when trying to establish to what end said object was originally used. Object classifications are stored in Altbase in the UMB DB, but are normalised to a much lesser degree than the description of contexts. On account of the number of objects (over 300,000), only the information pertaining to the runic inscriptions was exported into TAKERUN and split up into five entity types, OBJECT being the first. Much like CONTEXTS, OBJECT also saw a considerable reduction of columns, now basically only storing identifiers: *musitid, linjenr* as FKs connect it back to CONTEXTS (Figure 31 and table 51), while *objectid* is the PK and the other columns all store identifiers used over the course of these objects' existence as part of a museum collection. *xco, yco, zco* store coordinates, not to be confused with the coordinates attached to a context – these can be the same, but especially runic inscriptions were sometimes recorded with their individual coordinates, while the context (the "bag") contained finds from a larger area within the excavation (Section 7.2.1.)

Column Name	Data Type	Length	PK?	Not Null?
musitid	varchar	10	false	true
objectid	varchar	25	true	true
katalogsignatur	varchar	15	true	false
linjenr	varchar	10	true	false
tilvekstnr	varchar	10	true	false
alttilvekstnr	varchar	10	true	false
undernr	varchar	40	true	false
xco	decimal	10,3	false	false
yco	decimal	10,3	false	false
zco	decimal	10,3	false	false

Table 51. *Table structure OBJECT.*

Column Name	Data Type	Length	PK?	Not Null?
objectid	varchar	25	false	true
oidentification	varchar	150	false	true
oidensource	varchar	25	false	false

Table 52. *Table structure OBJECTIDENTIFICATION.*

Column Name	Data Type	Length	PK?	Not Null?
objectid	varchar	25	false	true
oclassification	varchar	150	false	true
oclassource	varchar	40	false	false

Table 53. *Table structure OBJECTCLASSIFICATION.*

Column Name	Data Type	Length	PK?	Not Null?
objectid	varchar	25	false	true
omaterial	varchar	150	false	true
omatsource	varchar	40	false	false

Table 54. *Table structure OBJECTMATERIAL.*

Column Name	Data Type	Length	PK?	Not Null?
objectid	varchar	25	false	true
oextra	varchar	255	false	false
oexsource	varchar	40	false	false

Table 55. *Table structure OBJECTEXTRAS.*

The decision to turn OBJECTIDENTIFICATION, OBJECTCLASSIFICATION, OBJECTMATERIAL and OBJECTEXTRAS into their own entity types (Tables 52 to 55) rests partly on these being different ways of describing an object. A "classification" is often based on the typological placement of a particular object within a wider group of objects of the same kind, whereas "object identification" can be understood as a less formal description of what the object *is* – if a typology existed for rune-sticks, an object could for example be identified as "owner's tag", classification "type arrowhead". No formal classification system for runic inscriptions is used in this study, although such would be desirable, since in the case of the Bryggen inscriptions, "classification" seems to depend more on the text content than on the physical characteristics of the object itself. Sticks showing no signs of having had any means of fastening them to goods, like arrowheads or holes, were classed (for example in *NIYR VI*) as owner's tag because the runes can be identified as an idionym, sometimes with the ownership statement *á*. That, however, implies a certain use in daily life. It does not seem particularly likely that all such inscriptions fulfilled the exact same purpose that owner's tags with bespoke physical features like arrowheads or holes would have. Keeping the data stored in columns labelled "classification" and "identification", although the cell content is often not too different from what can be found in the respective other, was therefore done with a view to potential future work on this. The decision was also guided by the fact that some of those columns are later revisions (and attempts at data normalisation) of the original description.

OBJECTIDENTIFICATION, OBJECTCLASSIFICATION and OBJECTMATERIAL are not JOINs, but, for now, stand-alone entity types containing the information from different columns in Altbase, almost identical to how, for example, CONFIRE was built until proper data normalisation can be undertaken. All information on single objects, discussed alongside idionyms in Sections 7.6.2 to 7.6.7, originates from these tables, although I have summarised the descriptions in Tables 61 and 67tab:invotags6.

One entity type in this part of TAKERUN is not, strictly speaking, part of the archaeological dataset: OBJECTEXTRAS. While migrating the data to the MUSIT-DB, transliterations, normalisations and interpretations of the runes on the objects were added in fields that, technically, are meant to store classifications and descriptions of the physical appearance of an object. These were removed from the respective columns (and, consequently, the first versions of OBJECTCLASSIFICATION, OBJECTIDENTIFICATION) and instead stored in OBJECTEXTRAS to await further processing, meaning moving them to TRANSLITERATION or NORMALISATION as appropriate and attaching a proper source. This will also require removing entries that are taken from *Rundatabas* or notes or publications by Liestøl, since they are already in TAKERUN and is a task for the future. The next sections discuss instead how the data from the archaeological research database was used to trace the use of runes by different groups of inhabitants in Bjǫrgvin.

7.5 Runes and objects

> [...] there is great potential to access the identities of actors through the study of such phenomena as (i.a.) raw material and product provenance, access to and control of resources, spatial distribution of production debris, and geographical patterning in object form and ornament (Hansen, Ashby & Baug 2015: 2).

Runic inscriptions, by their very nature as texts, allow for different insights than, for example, silk-embroidered shoes. They thus provide the opportunity to complement or contradict the pictures of town life emerging from analyses of other categories of finds. The main focus in this chapter is on combining the potential social/geographical implications of various idionyms and the texts they appear in with the archaeological classification/find location of the objects they were carved into to shed some light on the rune-carvers and to examine the use of runes throughout the development of Bjǫrgvin, following the request made by Hansen, Ashby & Baug (2015): "[W]e need to ensure that we do not overlook the people in our search for systems". Little can be said about the rune-carvers as individuals, yet using their names and the kinds of texts they wrote can reveal something about which groups of people may have lived in/visited

Bjǫrgvin. This is achieved via analysing the horizontal spatial distribution over the excavation area and the vertical distribution of inscriptions in time, while keeping in mind that numerous influences, not least varying levels of excavation in different units of the excavation grid, have impacted on the number of objects retrieved from each unit and therefore, observable patterns. This is mirrored in query formulation as well, when some objects are dated to more than one period or building phase. Depending on how the query is run, these will then appear twice/multiplied in result sets, which needs to be avoided by either

- using only periods as a reference point instead of building phases (an inscription dated to 5.1 or 5.2 still dates into period 5); this, however, requires adding another column in CONPHASE; or
- using a data subset respectively including or excluding all objects dated once/multiple times in any given query.

The first solution does not account for the possibility of an object being dated to, for example, 5.2 or 6.1 (period 5 or 6). This entry still is counted twice in queries taking only periods into account, which is acceptable, even required when comparing the total numbers of objects/period (Section 7.6).

The second option requires employing an SQL-VIEW-statement. VIEWs are virtual tables consisting of data subsets retrieved from the tables in the DB, and can be manipulated using the SQL-functions also used for manipulating tables. However, since they contain data subsets, they can be tailored towards a very specific purpose; in this case, I created two VIEWs, *datedonce* and *datedtwice* (Query C.49, C.50), to run queries separately for those two subsets. The latter needs manual checking to decide if and how the objects are to be included into any counts of totals, for example in a table such as Table 56. This shows a steady rise in rune-inscribed objects until period 5, then a steady decline until 8. In terms of absolute numbers (Table 50), the period between 1248 and 1332 yielded the most finds, closely followed by 4 (1198-1248). Period 6 (1332-1413), despite being almost as long as 5, yielded even fewer finds than 3 (1170/71-1198), and 7 (1413-1476) and 8 (1476-1702) counted considerably fewer objects.

However, it is risky to directly compare number of finds or even objects/year; the scarcity of rune-inscribed objects starting in period 6 is most likely a result of using machine-diggers in some excavation units to get to the lower layers (page 152). These scraped-off layers were not examined for small finds, which have consequently been lost. The lack of runic inscriptions should therefore not be taken as an indication for a scarcity of rune-inscribed objects during period 6 per se, although the case has been made that the German merchants from the Hanseatic kontor established on Bryggen from around 1350 (Helle 1982: 730-734) would likely not have made use of runes in the same way as Norwegians. The German merchants need not have made use of runes for runic inscriptions to be used in the area, though. The fishermen providing the Hanseatic merchants with their main commodity, stockfish, were Norwegians from further north; especially in the case of owner's tags, they could have stuck to their own tried-and-true system (Section 7.5).

A similar argument could also be made for period 7; 6, however, sees the outbreak of the Black Death in 1348/49 which decimated the population and radically changed life in Bjǫrgvin, in part by facilitating the Hanseatic merchants taking complete control of Bryggen by way of killing the Norwegian competition (Helle 1982: 731). By the time period 7 begins after the fire in 1413, Bryggen is definitely under German control, so the scarcity of rune-inscribed objects should probably be ascribed to that. Another contributing factor might have been that the Black Death – as with the rest of the population – also killed a significant percentage of those familiar with runes, resulting in an overall smaller number of rune-users. Knowledge as well as usage may then well have disappeared over the course of period 7, so that when 8 began after the 1476 fire, they were no longer used. Any definite conclusion when runes stopped being used by those living in this area of Bjǫrgvin is difficult; sometime before and around 1476 appears to be the best estimate considering the Hanseatic merchants in residence (Helle 1982: 730-732). Whether the same applies for other parts of the town, which

Period/Building phase	Objects dated once	Objects dated twice	Total	Objects/year
2.0	19			
2.1	2			
2.2	4			
Total Period 2	25		25	
3.0	70			
3.1	4			
3.2	18	2		
Total Period 3	92	2	94	3.5
4.0	118	3		
4.1	28			
4.2	11	1		
Total Period 4	157	4	161	3.2
5.0	62	1		
5.1	80	2		
5.2	29	6		
Total Period 5	171	8	179	2.1
6.0	20	1		
6.1	23	9		
6.2	7	4		
6.3	5	1		
Total Period 6	55	11	66	0.8
7.0	8	3		
Total Period 7	8	3	11	0.2
8.0	1	1		
Total Period 8	1	1	2	0.009

Table 56. *Number of objects carrying runic inscriptions dating to each building phase, based on Query C.51. Totals for periods are given minus those objects that, for example, are dated to 6.1 or 6.2 (Query C.52), which are only counted once. Objects dated to two different periods are counted once for each phase. No average object/year is calculated for period 2 on account of the insecure dating of its preceding fire.*

were to a larger extent populated by Norwegians and have not yet been excavated to the same degree as Bryggen, must also remain open. In any case, with 526 dated inscriptions and an approximation of 44 years as a duration of one period (Table 50, calculated excluding period 2 on account of its duration being unknown and 8 because of it continuing until 1702; Query C.56), approximately 1.7 runic inscriptions per year were preserved; how many were actually carved is unknown.

7.6 Runes, objects and contexts

Bringing together the results from Chapters 5 and 6 and the archaeological information, it turns out that 12 inscriptions carrying idionyms could date to different periods and are, consequently, counted once in each, while two are dated to different building phases and are only counted once for the period (Query C.59, Table 57). A full overview of how many and which idionyms are dated to which period can be found in Tables 58 and 59, but as Table 58 illustrates, period 5 has the highest total count of distinct idionyms, followed by period 4 and 3.

Considering the overall number of objects per phase, that was to be expected, but surprisingly, only ten objects carrying idionyms date to period 2, which totals 18 distinct idionyms. In part, this is because one character sequence was normalised as three different idionyms (INS134, Table 61), but also because one object carries seven distinct idionyms (INS14). This is a common occurrence; various lists of names appear in the material, also reflected in the numbers: the count of objects carrying idionyms, even only considering interlocutor-idionyms, already indicates that idionyms must appear on the same objects, and the count of tokens is even more indicative of this (Tables 58 and 60). While that count is artificially boosted by considering every normalisation of a character sequence as a token in its own right, only eight character sequences according to *NIYR VI*, nine to *Rundatabas* and 21 to Markali (1983), carved into a total of 27 objects, were normalised as two or more different idionyms.

Somewhat unexpectedly, less than half of the objects inscribed with runes also carry idionyms, invocation or interlocutor. This raises questions about the purposes runes were used for – the Bryggen material is generally known for the large number of owner's tags, rune-sticks used to label (and perhaps keep apart in storage) goods. Yet considering the majority of rune-inscribed objects do not carry idionyms, while others carry not one but several, it would appear that runes served a much greater range of purposes in urban society than marking ownership. While the system developed in Chapter 6 to tag runic inscriptions according to their text type/content is used later in this chapter to broaden the picture, the first survey focuses on PNs and potential implications for the potential social status of rune-carvers in Bjǫrgvin.

7.6.1 Townspeople

Evaluations/surveys of Bjǫrgvin's population and its composition based on the archaeological evidence have been undertaken by a number of people, most prominently Hansen (2006, 2008, 2010, 2015a,b,c, 2016) and Mygland (2023). The analyses undertaken in this chapter work with the idionyms' potential significance concerning their bearers' social status and/or geographic origins (Chapter 5). Based on the archaeological data, these were mapped across the excavation space and time, with the relevant maps and tables showing distribution patterns, object classifications and all idionyms identified per object (Figures 34 to 43 and Tables 61 to 67). They help to address the questions of which idionym, text types and combinations thereof appear during each period.

Another important table for this section is Table 60, presenting the total counts of distinct objects, idionyms and tokens thereof for each period by social-status-association. Objects/idionyms with broad dates which span two periods are included in this presentation in order to retain all possible information; they are marked in **bold**. Each group is referred to by its assumed social status despite these categorisations not being set in stone (Section 5.7). Potential implications of the object type are also taken under consideration. For ease of reading, the groups are referred to by shorthand like in Chapter 6: IH (Icelandic high-status), IL (Icelandic low-status), NH (Norwegian high-status), NL (Norwegian low-status), PSH (pan-Scandinavian high-status), PSL (pan-Scandinavian low-status).

Before looking at each period and its objects, it needs to be said that spatial comparisons within BRM 0 (regarding distribution into house rows, indicated by different colours in the distribution maps, Figures 34 to 42) returned no clear patterns. This lack can be explained in at least two different ways: the generally low numbers of objects used in this study, which does not allow for clear patterns to emerge. It is a regrettable shortcoming, but as explained (Section 7.4), it was impossible to normalise the data for all finds to the degree that would have allowed taking a larger group of finds into account and the Gullskoen grid situation

insid	Idionym	Period 4	Period 5	Period 6	Period 7
ins223	Halli			x	x
ins256	Hallvarðr			x	x
ins256	Hávarr			x	x
ins304	Heðinn	x	x		
ins173	Ió(h)an/Jó(h)an		x	x	
ins200	Ió(h)an/Jó(h)an		x	x	
ins20	María			x	
ins157	Ǫgmundr		x	x	
ins200	Þjóðgeirr/Þióðgeirr		x	x	
ins304	Þóraldi	x	x		
ins304	Þóraldr	x	x		
ins304	Þorbjǫrg	x	x		
ins200	Þorgils/Þorgísl		x	x	
ins304	Þórir	x	x		
ins220	Þórir			x	
ins200	Þorkell		x	x	

Table 57. *The 14 idionyms appearing on objects dated to more than one period/building phase. They are not listed again in Table 59 to avoid confusion.*

further complicated matters. Furthermore, since most of the objects originate from redeposited contexts, spatial comparisons between waterfront and back area are not as informative as hoped either. Another possibility is that runic inscriptions were used so ubiquitously on Bryggen that there never were clear patterns. This is far from unlikely considering how densely settled and likely busy the whole area was. It should also not be forgotten that – for all that BRM 0 was one of the largest medieval town excavations at the time – the area excavated still does not encompass the whole of Bjǫrgvin's town area. The lack of patterns indicating clearly distinguishable areas of activity may therefore not be as surprising as it seems at first. This survey is therefore mainly one of how the distribution of idionyms and types of inscriptions changed over the course of time.

To this end, distribution maps (Figures 34 to 43) are used, which require some explanation. Since so many of the objects lack coordinates, I used grid squares as reference points. The presence of objects is thus indicated either (in cases where coordinates are available) by a geometric symbol on the map, for example a square or circle, or, for objects without coordinates, their presence and count per excavation unit is indicated by the number shown in the unit in question. Overlap was avoided by means of only using one way to reference an object; if three objects are found in the same excavation unit, one of which has coordinates, the number in this unit shows "2" and the geometric symbol for a single find shows up in addition, adding up to three objects found in this excavation unit. A complete list of all objects, including a list of the idionyms they carry, can be found in the bespoke table for each period, including the excavation unit where they were found for easier cross-referencing, for example Table 61.

Since the original aim was to compare patterns across the excavation area (which did not work as hoped), clarity and simplicity were given preference, meaning that the idionyms themselves are not displayed in the maps, nor the *insids*; maps and tables need to be used in conjunction. This resulted in an unexpected problem: the coordinates do not always place the objects in the same excavation unit as the grid reference does, for example INS543 (Table 63 and fig. 35). According to the coordinates, it was found in O03, whereas according

Period	2	3	4	5	6	7
Count of rune-inscribed objects	25	94	161	179	66	11
Count of objects carrying idionyms	10	37	71	66	30	5
Count of distinct idionyms	18	49	87	107	37	7
Count of objects carrying interlocutor-idionyms	10	35	70	58	19	5
Count of objects carrying invocation-idionyms		4	3	12	11	

Table 58. *Count of distinct objects and idionyms by period (Query C.61). Note that objects and idionyms may date to/appear in several periods and are therefore counted more than once in this table (Query C.62, C.65, Tables 57 and 59).*

to CONUNIT, it was found in P02. As mentioned earlier, coordinate placement was given preference over the unit with the justification that if they are available, coordinates are likely the more reliable source owing to the importance of runic inscriptions as finds. A note is attached where I have noticed this discrepancy in the tables.

Where possible, maps also show the distribution of several idionym groups combined to allow for better comparison of patterns, but owing to idionyms from different groups appearing on the same object and the resulting overlap, maps frequently needed to be displayed separately (see also page 172).

Lastly, since many objects were redeposited, their location is only indicative of where they ended up after they had been moved from where they were used. The general availability of items required for rune-carving (a stick of wood and a knife) suggests that this activity could be carried out by people regardless of social standing and at very short notice. Yet people apparently cared to a certain extent about what kind of item they used. Many of the finds are small wooden sticks (more or less) carefully cut to offer four sides on which the runes are carved. While the level of skill varies, especially the owner's tags tend to be elaborate, either showing hooks or holes, by which means they could be fastened to something. Object type is noted in the tables alongside idionyms and house row-association (for example Tables 61 and 68). In order to single out objects of particular interest, not every object is identified, mostly owing to the fact that most of the objects are simply classed as "rune-stick". The tables therefore only list object classifications other than "rune-stick".

7.6.2 Period 2 (ca. 1120-1170)

In period 2, 18 distinct interlocutor-idionyms possibly denoting 19 individuals appear in 10 inscriptions (Tables 58 and 61), most of which were found in the back parts of the properties. The number of individuals the idionyms belonged to can be calculated by using Query C.71 on the basis of how many distinct *insnids* are logged (however, if the same idionym appears twice on an object, it will be counted twice, so these numbers must be taken with a grain of salt). One or two idionyms (depending on the normalisation chosen) are classed as IH, seven NH and two more PSH, with one each in the low-status groups and seven without determinable social status (Tables 60 and 61. NH- and PSH-idionyms prevail over IH, whereas the picture appears to be fairly even for the low-status idionyms. High-status idionyms count more tokens than low-status ones, unless the status-less idionyms are considered part of the low-status group (which may be the case, Section 5.7.4). More men of potentially high social standing are visible in runic inscriptions during period 2, suggesting either the physical presence or some connection of several men of high social standing to Bjǫrgvin. This ties in neatly with the hypothesis of plots being given to and owned by followers of the king (Hansen 2005a), although several of the idionyms appear in the form of a list (INS14). The only female idionym for which potential social status can be assigned is PSL *Hallbjǫrg*, INS496. Following Mygland (2015),

Period	Idionyms
2	Arnviðr, Benedikt, Bergsveinn, Eiríkr, Eyvindr, Glúmr, Grímr (2), Hallbjǫrg, Hallkatla, Haraldr, Ingjaldr/Ingialdr, Jón, Ljótr/Liotr, Magnús, Sigurðr (3), Týhvatr/Tivatr, Þjóðarr, Þorgils/Þorgísl
3	Agnbjǫrg, Andreas/Andrés, Ari (2), Arnbjǫrg, Arnbjǫrn, Arni, Ása (3), Auðmundr, Auðr, Bjǫrn/Biǫrn, Bubba, Eindriði, Eldjarn/Eldiárn, Erlendr, Eysteinn, Finnr, Gunnarr (3), Gyrðir, Gyrðr, Hálfdan, Halli, Hallsteinn, Heinrekr, Ingibjǫrg/Ingibiǫrg, Ió(h)an/Jó(h)an, Klas, Lúcia, Margrét(a), María, Óðinn, Ólafr (2), Ǫlvir/Ølvir, Ǫnundr, Poppe, Rúnolfr, Sessi, Sigríðr, Sigurðr (3), Sveinn, Tonna, Þorgrímr, Þórir, Þorkatla, Þorkell (2), Þórr, Þorsteinn, Þorvaldr, Þorvarðr, Þúfa
4	Án(n) (2), Áni (2), Anna, Anne (2), Arni (6), Ásgeirr, Áslákr, Auðun, Bárðr, Benedikt, Benedikta, Bergþóra, Bergþórr, Bjarni/Biarni, Bótleifr, Brandr, Búi, Búr-Almarr, Einarr (3), Eindriði, Eiríkr (4), Erlendr (2), Erlingr, Eyjolfr/Eyiólfr, Finnr (3), Gísl, Grímr, Guðmundr, Guðríðr, Guðrún, Gunnarr (4), Gunnhildr, Gyða (2), Gyrid, Halldórr, Hallgísl/Hallgils, Hallkell, Hávarðr, Heðinn, Hrólfr (Rolfr), Ió(h)an/Jó(h)an (2), Ívarr (3), Johannes, Jón (2), Kárr, Kolbeinn, Kolbjǫrn, Ljótr/Liotr, Lúcia, María, Munán, Ólafr (3), Ormr (2), Ormríkr, Óttarr, Ragnarr, Rannveig, Sámr (2), Samson, Sigbaldr, Sighvatr, Sigríðr (2), Sigurðr (6), Sigvaldi, Sigvaldr (2), Símon, Sǫlveig, Steinarr, Styrkárr, Únás(s), Vébrandr, Þóraldi, Þóraldr, Þorbergr, Þorbjǫrg, Þorbjǫrn, Þórðr (2), Þorgils/Þorgísl (2), Þorgunna, Þórhallr, Þóri, Þórir (5), Þorkell, Þorleifr, Þormóðr (2), Þórr (2), Þorsteinn
5	Amor, Andreas/Andrés, Arni (4), Ása (2), Auðr (2), Bárðr, Benedikt, Birgir, Bjarni/Biarni, Bóthildr, Christus (2), Constantinus, Didrik, Dionysius (2), Egill, Eindriði, Einri, Eiríkr (3), Erlendr (2), Erlingr, Eygísl/Eygils, Eyjolfr/Eyiólfr, Eysteinn, Finnr, Gabriel, Grímnir, Guðmundr (2), Guðsteinn, Guðþormr, Gunnarr (2), Gunnsteinn, Gusir, Gussir, Hafdjarfr, Halli, Hallkatla, Hallvarðr (2), Hávarr, Heðinn, Heinrekr (2), Helgi (2), Herikr, Holmr, Illugi, Ími (2), Inga, Ingibjǫrg/Ingibiǫrg, Ingimundr, Ingiríðr, Ió(h)an/Jó(h)an (2), Ívarr, Jesus, Johannes (2), Jón (3), Jórunn/Iórunn, Kátr, Kattr, Klémetr (2), Kǫttr, Lafranz (2), Loðinn, Malchus, Margrét(a), María (2), Maximianus, Michael/Mikiáll (2), Myttar, Narfi, Nikulás/Nikolás, Ólafr (4), Ǫgmundr, Ǫlrekr, Pétr, Philomena, Ran, Raphael, Reiðarr, Sámr, Sægunni, Serapion, Sigríðr, Sigurðr (3), Smiðr, Tast, Tereus, Thomás, Vígdís, Vígi (3), Vilhelmus/Vilhiálmr, Yggjar/Yggr, Þiðrikr, Þjóðgeirr/Þióðgeirr, Þólfr, Þóra, Þóraldi (3), Þóraldr (3), Þorbjǫrg, Þorbjǫrn (2), Þórðr (2), Þorfinnr (2), Þorgarðr, Þorgils/Þorgísl (2), Þórhallr, Þórir, Þorkatla, Þorkell (2), Þorlákr, Þorsteinn, Þorviðr
6	Abed-Nego, Bótolfr, Christus (3), Einarr (2), Elisabet(h), Erlendr, Gunnarr (2), Hákon, Helga, Helgi, Ingibjǫrg/Ingibiǫrg, Ió(h)an/Jó(h)an (2), Jesus, Johannes (2), Jón (2), Karl, Kolbeinn (2), Lukas (2), María (8), Markús, Mat(t)heus (2), Mesak, Óðinn (2), Ǫgmundr (2), Pálni, Sadrak, Sigurðr, Tobias, Vémundr, Yngvildr, Þjóðgeirr/Þióðgeirr, Þorgils/Þorgísl, Þórir, Þorkell
7	Gunnarr, Halli, Hallvarðr, Hávarr, Lunaney, Ótto, Þorsteinn

Table 59. *Idionyms sorted by period, based on Query C.64, excluding those in Table 57; tokens in brackets if n>1.*

	Period 2			Period 3			Period 4		
	I	T	O	I	T	O	I	T	O
No status	5	6	4	14	16	9	32	42	33
IH	2	2	2	11	12	11	16	24	18
IL	1	1	1	1	1	1	5	5	5
NH	5	7	3	9	16	14	22	40	23
NL	1	1	1	1	1	1	1	1	1
PSH	3	3	2	6	6	5	7	11	8
PSL	1	1	1	2	2	2	3	5	4
No status %	27.78	28.57	28.57	31.82	29.63	20.93	37.21	32.81	35.87
IH %	11.11	9.52	14.29	25.00	22.22	25.58	18.60	18.75	19.57
IL %	5.56	4.76	7.14	2.27	1.85	2.33	5.81	3.91	5.43
NH %	27.78	33.33	21.43	20.45	29.63	32.56	25.58	31.25	25.00
NL %	5.56	4.76	7.14	2.27	1.85	2.33	1.16	0.78	1.09
PSH %	16.67	14.29	14.29	13.64	11.11	11.63	8.14	8.59	8.70
PSL %	5.56	4.76	7.14	4.55	3.70	4.65	3.49	3.91	4.35
	Period 5			Period 6			Period 7		
	I	T	O	I	T	O	I	T	O
No status	29	33	21	4	5	5	3	3	3
IH	14	18	16	4	5	4	0	0	0
IL	4	4	4	1	1	1	0	0	0
NH	23	36	28	10	11	8	2	2	2
NL	2	4	4	0	0	0	1	1	1
PSH	9	14	11	3	5	5	0	0	0
PSL	1	1	1	2	3	2	1	1	1
No status %	35.37	30.00	24.71	16.67	16.67	20.00	42.86	42.86	42.86
IH %	17.07	16.36	18.82	16.67	16.67	16.00	0.00	0.00	0.00
IL %	4.88	3.64	4.71	4.17	3.33	4.00	0.00	0.00	0.00
NH %	28.05	32.73	32.94	41.67	36.67	32.00	28.57	28.57	28.57
NL %	2.44	3.64	4.71	0.00	0.00	0.00	14.29	14.29	14.29
PSH %	10.98	12.73	12.94	12.50	16.67	20.00	0.00	0.00	0.00
PSL %	1.22	0.91	1.18	8.33	10.00	8.00	14.29	14.29	14.29

Table 60. *Counts of different idionyms (I), their tokens (T) and count of objects (O) they appear on according to social status per period used for χ^2-testing. Numbers acquired via Query C.67, C.70. The counts include different normalisations of the same letter sequence and objects dated to two different periods.*

who discusses the possibility that there was a female workforce on Bryggen, mostly in the form of female servants employed in different households, a Pan-Scandinavian low-status idionym in a runic inscription could potentially indicate the presence of such a female servant. There are two problems with this interpretation: the inscription was found in general fillmasses underneath a passage, so there is no primary context tied to a certain property/household which could substantiate the hypothesis; and, as explained in Section 5.7.4, the comparatively low frequency of an idionym in the diplomataria does not necessarily translate to it indicating a person with a lower social status when

Row	Unit	Inscription	Idionyms	Object	Text tag
Bugården	K11	ins14	Arnviðr, Glúmr (IL), Haraldr (NH), Jón (PSH), Magnús (PSH), Sigurðr (NH, 3), Þorgils/Þorgísl (NH)		prayer, quote
		ins196	Grímr (2)		
Søstergården/ Gullskoen	N06	ins65	Benedikt (IH)		
	O06	ins80	Eiríkr (NH)	owner's tag	owner's tag, trade
	P06	ins88	Eyvindr (NH)	owner's tag	owner's tag, trade
Gullskoen	M04	ins134	Ljótr/Liotr (IH) / Týhvatr/Tivatr / Þjóðarr	owner's tag	owner's tag, trade, not interpretable
	N05	ins509	Hallkatla (f)		
		ins66	Bergsveinn (NL)	owner's tag	owner's tag, trade
	O05	ins103	Ingjaldr/Ingialdr (PSH)	owner's tag, tally stick	owner's tag, trade
		ins496	Hallbjǫrg (f, PSL)	tally stick	

Table 61. *Overview of idionyms and classification of objects dating to period 2, see Figure 34. Count of tokens and social status of single idionyms noted in brackets. Variations in idionym-identification indicated by " / " between the options. Based on Query C.69. Where no object classification is provided, it is "rune-stick".*

found in a runic inscription. The same applies to *Hallkatla* on INS509, also feminine and found in the neighbouring unit N05. While the possibility that these two women might have been female servants working on Bryggen should definitely be considered, the inscriptions cannot be used as proof that this was the case.

This lack of information is characteristic for most of these inscriptions; coordinates are available for INS134, INS65, INS80, INS88. INS134, INS80 are found in general fillmasses. Querying for surrounding/related structures, INS65, INS66, INS80, INS88 return additional information, most of which is unspecific enough to suggest either redeposition or at least make it impossible to decide whether the context might have been primary. None of the idionym-carrying objects from period 2 can therefore be considered as having been found *in situ*.

With only three mapped objects, it is difficult to say anything about patterns regarding IH and IL (Figure 34). The most that can be said is that both IH-objects were found closer to each other roughly in the middle of the excavation area, while the IL-object was found closer to the harbour area – this is the same object shown in K11, which only becomes clear when looking at Table 61. N- and PS-idionyms do not fare much better; they, too, count so few objects that no patterns become visible. Taken together, though, all interlocutor-carrying objects from this period appear roughly in the middle of the excavation area away from the waterfront. It is, however, not clear whether that is representative of the general distribution or due to excavation methodology; not all excavation units were dug to the same depth, not to mention that runic inscriptions were only recognised as important objects a few years into the excavation, resulting in an uneven spread of finds across the area.

In period 2, INS103, INS134, INS65, INS66, INS80, INS88 are considered owner's tags, INS103, INS496

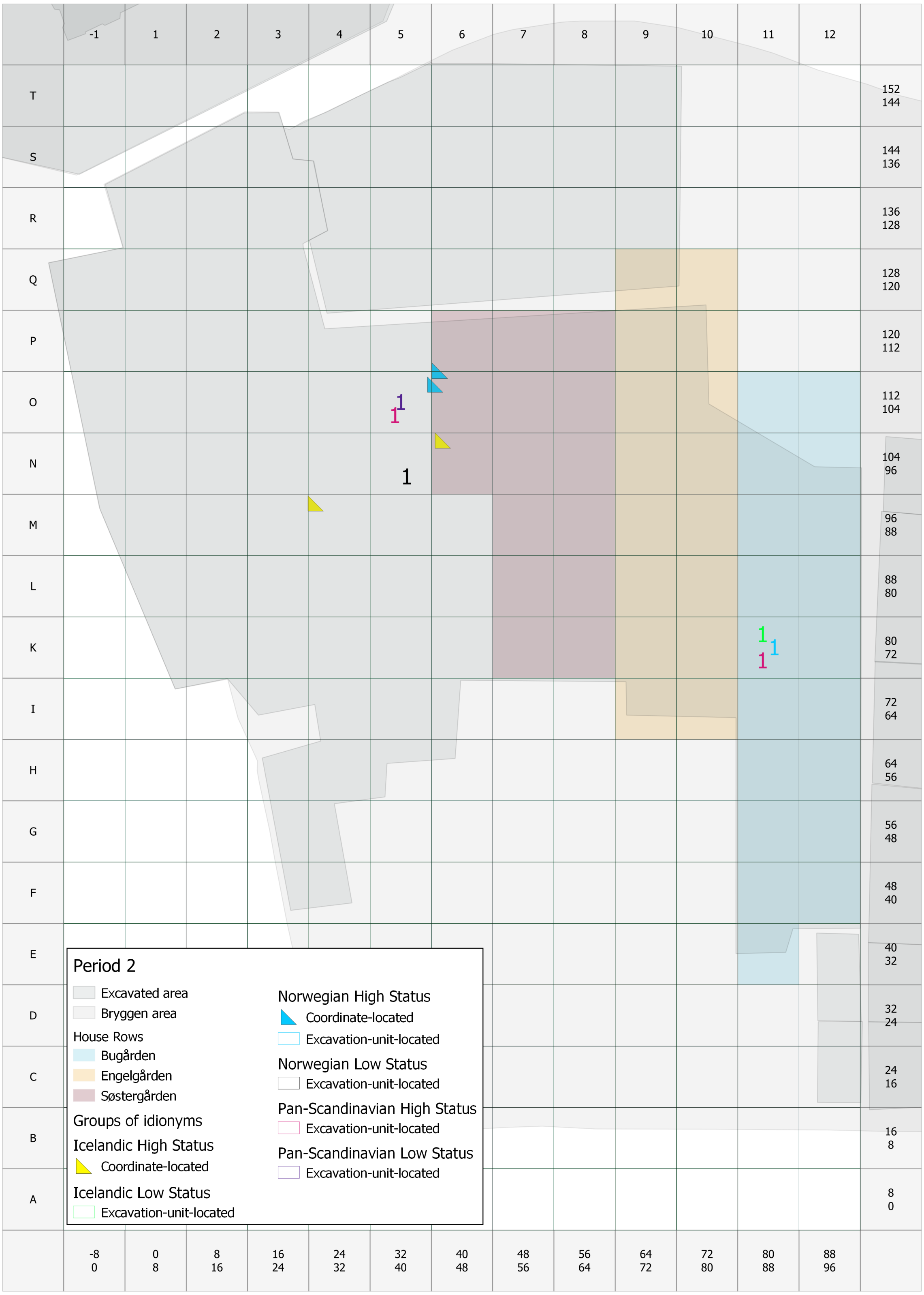


Figure 34. *Distribution of different groups of idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 2.*

tally sticks (Table 61). This could indicate that these objects were used in professional trading and it is interesting to note that the latter stick carries the aforementioned *Hallbjǫrg*, raising the question of why a potentially low-status feminine idionym would appear on an item connected to professional trade. Several scenarios are conceivable; perhaps Hallbjǫrg was a professional tradeswoman, possibly on a small or local scale. Within the context of a rising trading town, it is however equally plausible that Hallbjǫrg was the recipient of goods, meant for her own or the household she was serving in. Since there is no information available about the kind of goods the tally marks refer to, it is not entirely unthinkable that she could have been a female servant overseeing a larger household. As such, she might have been in charge of the acquisition of goods for household purposes, similar to what has been suggested for *Lunaney* 5 periods later (Liestøl & Johnsen 1980-1990: 111-112).

Reservations are in order, though. To begin with, tally marks and idionym need not be connected, or Hallbjǫrg could have been counting something else entirely. This also applies to other sticks carrying tally marks. While it is certainly more satisfactory to consider them as evidence of trade, this is not the only area of human activity where keeping count is important. There is no indication that the items being counted were trading goods. Hallbjǫrg need not even have carved her name into the stick herself, or she may have reused a convenient piece of wood for her own purposes. So while the presence of a potentially low-status Pan-Scandinavian feminine idionym on a tally stick does open up for the possibility that she was somehow involved in the trading activities of the town around her, it is important to remember that more evidence is required for such a conclusion.

Since the majority of objects from period 2 are identified as owner's tags, this is an important discussion. These items are generally considered connected to trading activities, but whether the trade was on a large or small scale, local or international must remain an open question. Tally sticks could be used for professional or private purposes, on big and small scales, since the activity of keeping count is hardly restricted to traders. Animal herders, for example, could have made use of them for the same purpose. It is certainly very likely that at least some of the owner's tags and tally sticks used in Bjǫrgvin were connected to trading activities; at the same time, it is probably premature to assume that *all* of them, without exception, originate in that context. This is all the more the case since Hansen 2005a: 205-209 discusses the possibility of long-distance and/or professional trade being conducted in period 2 Bjǫrgvin, reaching the conclusion that at least for this period, "[n]o tools of trade, indicators of international contact nor storage buildings were assigned [...]" (Hansen 2005a: 209). Although she adds the caveat that "hardly any finds have been assigned to horizon 2 at all, and the lack of finds cannot be used as a source" (Hansen 2005a: 209), one should nevertheless exercise caution when considering the owner's tags from period especially as indicators of international trade.

Still, the fact that most of the objects are identified as having served this purpose seems to indicate that PNs during period 2 were mainly carved with the purpose of indicating ownership of something. The fact that most objects also carry only one idionym, or the same idionym twice, further supports this. The need to indicate ownership was apparently also more pronounced amongst those with a potentially high social status, although there are three lower-status idionyms in the group, one of them possibly Icelandic. *Glúmr* appears on INS14 though, which not only carries almost half of all idionyms from this period, but is also indeterminable as an object. It is not recognisably an owner's tag, nor can it be considered a tally stick.

This and similar objects have been interpreted as lists of names, perhaps of a ship's crew (Liestøl 1964a: 15-16). If that is the case (and it is by no means beyond possibility) then said crew consisted almost exclusively of men carrying potentially high-status idionyms, excepting the aforementioned *Glúmr* and *Arnviðr,* whose potential social status cannot be determined at present. Considering this and the widespread practice of trading in a *félag* – basically a company – perhaps that is actually the best explanation concerning the purpose of this inscription, and this particular company consisted mainly of Norwegians judging by their idionyms. Wieske (2011: 88-98, especially 94, 98), however, points out that a *félag* consisting of more than two partners is a rare occurrence and that the laws regulating the partnership mostly apply to situations with two partners, not several, which contradicts this interpretation.

In conclusion, most of the idionyms-inscribed objects with runes from period 2 appear to have been carved with the intention of signalling ownership, of what and to whom is difficult to determine, not least because all of the contexts they were discovered in are secondary.

7.6.3 Period 3 (1170-1198)

In period 3, a potential total of 48 individuals and their idionyms appear on 34 objects (Query C.71, C.70). The count of different idionyms totals at 44; several character sequences can be normalised in different ways (Table 63). None of the idionyms from period 2 reappear in period 3, and no low-status feminine idionyms appear.

Still, examples for every group are present: *Eindriði, Þorgrímr, Finnr, Hálfdan, Ari, Rúnolfr, Arnbjǫrn, Þorvaldr/Þorvarðr, Arni* and *Erlendr* are classed as IH-idionyms, with *Ari* appearing two times and possibly denoting two individuals considering that the two inscriptions, INS12 and INS507 were found in excavation units L08 and M05 respectively. Both contexts are evaluated as secondary, however, with the objects found in general fill-masses. Inscriptions carved by different hands, but carrying the same idionym, are often considered as referring to two individuals with the same name. In actual fact, they could as well refer to the same individual and carved by two different people, meaning the Aris referred to might therefore still have been the same individual. In this case an argument could be made that this is not the case, because the two items were discovered on different properties and according to Hansen (2005a: 48), "[...] people in the Middle Ages generally did not throw garbage and waste onto the neighbour's plot [...]". However, in my MA dissertation I looked at owner's tags carrying the same idionym and so similar in make that they almost certainly belonged to the same person (Magin 2014: 101-102 and Table 18). This concerns eight objects/inscriptions, likely belonging to five men since two inscriptions consist of two idionyms.

Inscription	Idionym	Row
ins78	Eiríkr	Bugården
ins79	Eiríkr	Engelgården
ins95	Gunnarr	Engelgården
ins96	Gunnarr	Søstergården
ins121	Sámr	Engelgården
ins122	Sámr	Engelgården
ins152	Þorsteinn, Sigurðr	Søstergården
ins153	Þorsteinn, Sigurðr	Engelgården

Table 62. *Distribution of owner's tags likely referring to the same person.*

As can be seen, only the two *Sámr*-inscriptions were found in the same house row, whereas the other six inscriptions were found in neighbouring house rows. In Magin (2014: 102), I presented three potential explanations for this observation:

1. Merchants were not necessarily tied to a specific property, perhaps owed to them coming from abroad or other parts of Norway. When arriving in Bjǫrgvin, they took rooms or rented storage space in different properties, depending on availability. Alternatively, they could have been small-scale merchants setting up shop in different areas of Bryggen, again depending on the spaces available on any given day.
2. Hansen (2005a) is correct where general waste disposal is concerned, but objects like owner's tags do not follow this pattern for a variety of reasons, e.g. they were lost instead of thrown away, or potentially thrown away by outsiders who did not feel the need to adhere to local customs of garbage disposal (see point 1).
3. The owners of the tags (and the goods they marked) traded with different merchants in Bjǫrgvin, potentially because their trade partners were only interested in specific goods and they therefore had to sell their wares to different people.

Last but not least, documentation errors can also not be ruled out completely, although given the care especially runic inscriptions were treated with, this is less likely. Returning to the question posed above, there is therefore a possibility that the two Aris are actually the same person even if the inscriptions look different. Additionally, INS12 also carries *Ólafr*. It is not clear whether that is a reference to Saint Ólafr (Section 5.5.4). If the Ólafr in question was not the saint, INS12 could be interpreted as representing trade or some kind of connection between a Norwegian and an Icelander, both of possibly high social status. Sadly, the object was not clearly identified, so there is no information to be gleaned from this.

None of the other objects from this group except INS494 carrying *Arni* and INS297 were identified either. Excepting INS12 and INS297, none of them carries more than one idionym, though (provided that *Þúfa* on INS146 is a byname), which could imply that once more, the purpose of the inscriptions was to signify ownership of something, although that does not preclude that some of these inscriptions were carved out of boredom and/or a wish to exercise one's rune-carving skills. In the case of INS494, it is likely that Arni was trying to mark his property, since this item is identified as a wooden knife, and in the case of the second Ari on INS507, it was carved into a rowlock pin. These inscriptions do not suggest an accident or something done out of boredom.

INS297 features the exception insofar as the IH-idionym appears once more in a list similar to INS14 from period 2, where the odd one out is IL *Glúmr*, while the rest points towards several Norwegian men of potentially high social standing, perhaps all part of a *félag*. In INS297, though, there are more exceptions than recognisable rules. Not only does the inscription feature idionyms from high-status groups of both countries, but potentially also one feminine NL-idionym, *Arnbjǫrg,* PSH *Heinrekr,* which could indicate a foreigner, *Bubba/Poppe,* which poses a problem to scholars, and two or three, depending on normalisation, idionyms with no currently determinable social status. The occurrence of so many idionyms potentially denoting high social status of name-bearer and a feminine idionym in the middle of a list of masculine idionyms (regardless of normalisation, *Agnbjǫrg/Arnbjǫrg* are both feminine) makes one wonder what this group of people could have had in common for their names to be inscribed in the same shard of, interestingly, ceramic. In other words, it is harder to interpret this particular inscription as a group of men making up a ship's crew/*félag*, even if there was no restriction in terms of geographic origin of the partners (Wieske 2011: 97-98). Determining the reason behind the carving is further confounded by this "list" being carved into a ceramic shard. Unfortunately, the object identification from B_Gjenstand identifies it as "kar", vessel with no further information provided on what type of ceramic it could have been. A ship crew appears unlikely; an alternative solution could maybe be a customer list? Or, perhaps a bit beyond what we imagine to be possible, a list of attendants at a certain event, where one attendant for some reason decided to note down the names of all those present? Regardless, the inscription is difficult to place in a trading context. Excavation documentation reveals nothing more than that the shard was found north of a caisson at the same level as an undefined layer of beams in a drip, most likely a redeposition, and not providing any additional information to help solve the mystery.

None of the other contexts can be considered a primary context either, mostly because they were discovered somewhere close to a caisson or foundations, without there being enough evidence to definitely tie them to this particular structure (Section 7.2.2.) Objects carrying IH-idionyms were found almost all over the excavation area (Figure 35), perhaps indicating both presence of Icelanders and interactions with the local Norwegian population. The distribution is not due to period 3 not having been excavated to the relevant depth in the back of the excavation area, either. Perhaps some storage rooms for goods and wares were further removed from the harbour than others, for excepting INS494, the wooden knife, the other objects found so far back appear to be owner's tags. This is also the case for the only inscription carrying an IL-idionym, INS83 with the already discussed *Eldjarn/Eldiárn* (Section 5.7.1). It was found in redeposited fillmasses under building 35 (Figure 36), and whether its original owner was a

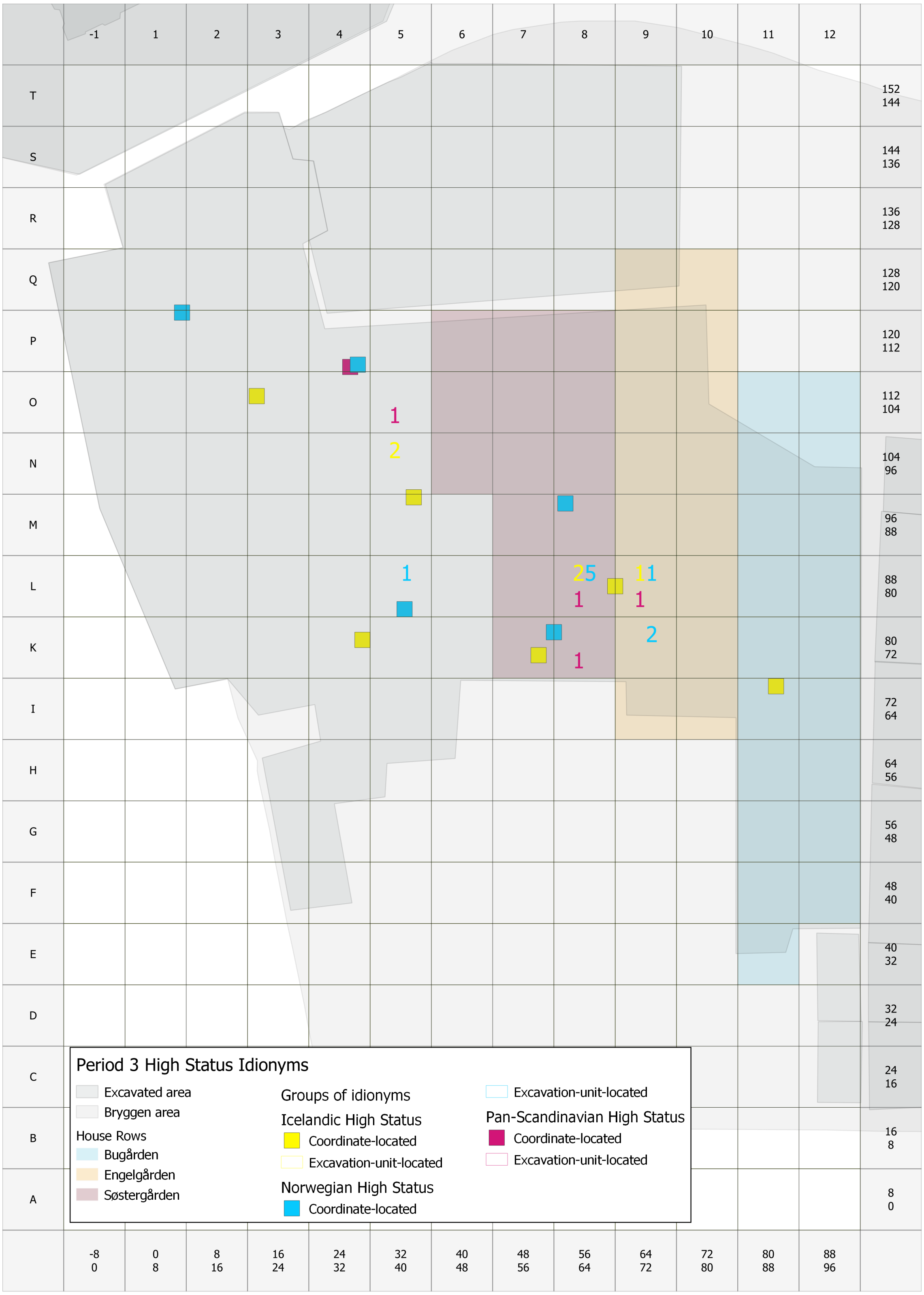


Figure 35. *Distribution of different groups of high-status idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 3.*

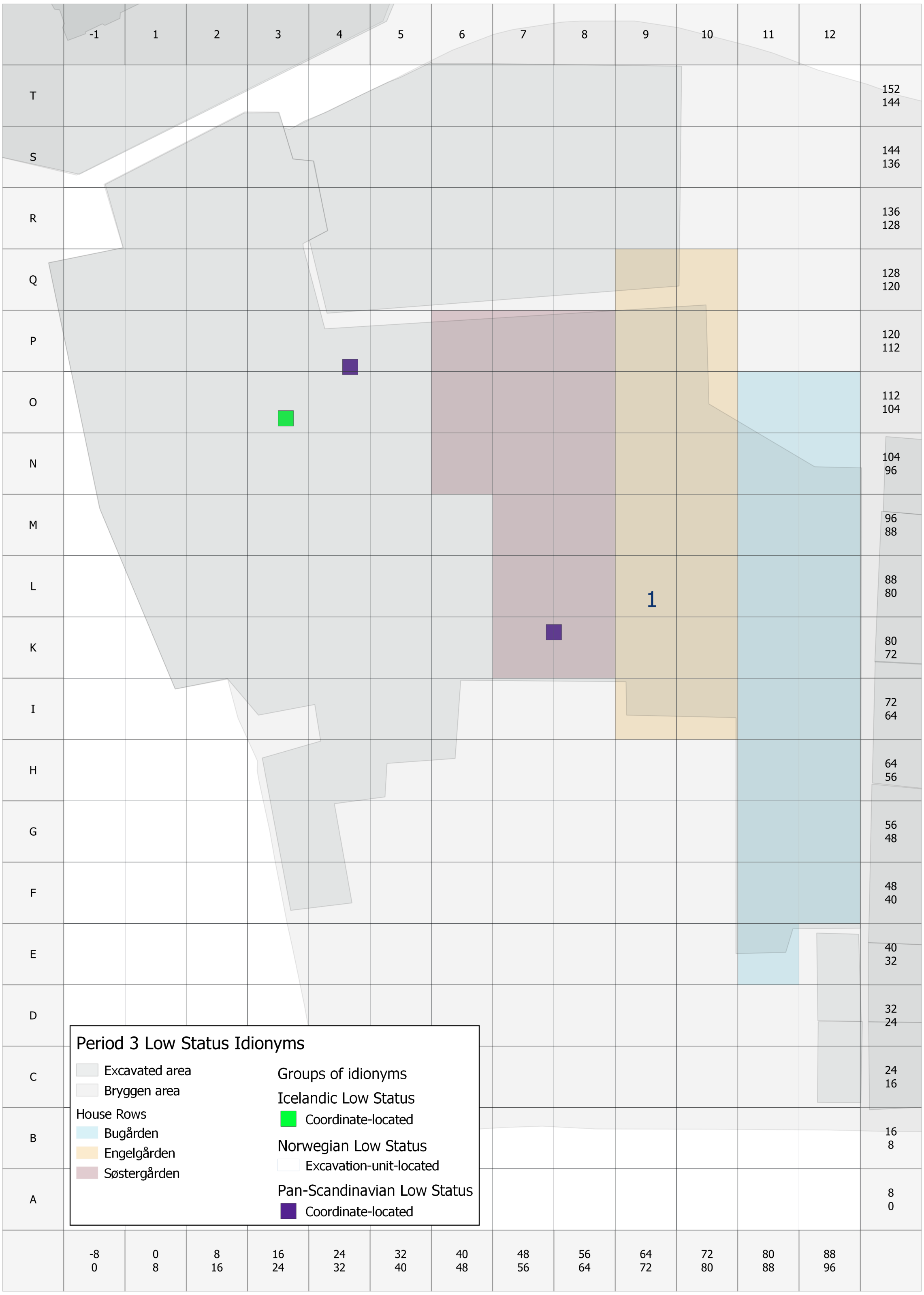


Figure 36. *Distribution of different groups of low-status idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 3.*

Row	Unit	Inscription	Idionyms	Object	Text tag
Bugården	I11	ins74	Eindriði (IH)		owner's tag, PN, trade
Engelgården	K09	ins308	Ása (f, NH)		
		ins87	Eysteinn (NH)		owner's tag, trade
	L09	ins297	Agnbjǫrg (f) / Arnbjǫrg (f, NL), Arnbjǫrn (IH), Bubba / Poppe, Gunnarr (2), Hallsteinn, Heinrekr (PSH), Ió(h)an/Jó(h)an (PSH), Þórir (NH), Þorkell (NH)		
Søstergården	K07	ins413	Þorkatla (f, PSL) / Þorkell (NH)[2]	bast	
		ins89	Finnr (IH)		owner's tag, trade
	K08	ins38	Klas		christian, incantation, list, magic, owner's tag, quote
		ins435	Sigríðr (f, PSH)	wood splinter, needle	
	L08	ins100	Hálfdan (IH)		owner's tag, trade
		ins12	Ari (IH), Ólafr (NH)		christian, comment, owner's tag, PN
		ins120	Rúnolfr (IH)		owner's tag, PN, trade
		ins152	Sigurðr (NH), Þorsteinn (NH)		owner's tag, PN, trade
		ins428	Ása (f, NH)		
		ins429	Gyrðr (NH) / Gyrðir[3]	key(shaft)	
		ins437	Ǫnundr (NH)		
		ins438	Ingibjǫrg/Ingibiǫrg (f, PSH)		comment, pub environment, smut
		ins96	Gunnarr		owner's tag, trade
	M08	ins609	Ása (f, NH)		
	N06	ins135	Tonna (f)		owner's tag, PN, trade
Gullskoen	K04	ins146	Þorgrímr (IH), Þúfa (f)[4]		owner's tag, PN, trade
	L04	ins64	Auðmundr / Auðr (mf)		owner's tag, PN, trade
	L05	ins424	Ólafr (NH)	wax tablet	letter, period context, quote, regular
		ins477	Ása (f, NH)		
	M05	ins507	Ari (IH)	rowlock pin, nail	
	N05	ins156	Þorvaldr (IH) / Þorvarðr (IH)		owner's tag, PN, trade
		ins494	Arni (IH)	wooden knife	
	O03	ins83	Eldjarn/Eldiárn (IL)		owner's tag, trade
		ins543[5]	Erlendr (IH)		
	O05	ins488	Bjǫrn/Biǫrn (PSH)		
	P01	ins605	Sigurðr (NH)		
	P04	ins128	Sigurðr (NH)		owner's tag, PN, trade
		ins533	Sessi		
		ins539	Halli (PSL), Margrét(a) (f, PSH)		
	P05	ins491	Lúcia (f), Sveinn		

Table 63. Overview of idionyms and classification of objects dating to period 3, see Figures 35 to 36. Count of tokens and social status of single idionyms noted in brackets. Variations in idionym-identification indicated by " / " between the options. Where no object classification is provided, it is "rune-stick".

local carrying an idionym that simply never made it into the diplomas in Norway, or – considering the potential social status – an Icelandic sailor visiting Bjǫrgvin, or even a local of mixed background, must remain open. There is no indication that this inscription and IH-*Erlendr*, potentially also discovered in O03, were connected.

Sixteen tokens of NH-idionyms date to period 3, four of which are feminine *Ása* (Table 63). Why so many and only Ásas appear in this, comparatively short, period (27 years) is a mystery. The idionym only appears on five inscriptions in total, with the last one dating to period 5 and the sixth occurrence marked *invocation*. This distribution brings to mind a certain fashion amongst the inhabitants or an otherwise unprecedented influx of Ásas into town. Since the idionym, despite being feminine, sorts into quartile 3 in *DN*, the name-bearers in this case could have been women of fairly high social status rather than servants, although their distribution in neighbouring or nearby excavation units (M08, K09, L08, L05) might also indicate that Ása was the same woman. One potential argument for this are the property boundaries that stretch across some of the excavation grid squares: M08 and L09 likely belonged to the same property, potentially K09 as well. L05, however, likely belonged to a different property (Hansen 2006; pers. comm. Gitte Hansen).

The find locations in secondary contexts in the waterfront area suggests that the objects were redeposited in the process of waste disposal (Figure 35). INS609 carries a declaration of love presumably meant for Ása, unless someone was quoting, whereas most of the other inscriptions were not interpreted beyond identification of the idionym. Ultimately, it is impossible to decide whether period 3 provides evidence for four different Ásas who, apparently, all knew how to carve runes or at least had admirers who could, or one or two Ásas, who may or may not have been neighbours.

The masculine NH-idionyms are *Þorkell, Eysteinn, Ólafr, Sigurðr, Þorsteinn, Gyrðr, Ǫnundr, Þórir*. Reservations are attached to one instance of *Þorkell,* INS413, where the character sequence in question could also be normalised to *Þorkatla,* a feminine PSL-idionym. Considering the difficulty of deciding on an interpretation when the name-bearer in question might either be a Norwegian man of possibly high social status or a Scandinavian woman of (potentially) low status, nothing definite can be said, other than for INS156, where both possible normalisations are classed IH. That this particular inscription is written down on a piece of bast or tree bark could indicate that it was carved as a result of boredom, which, however, does not help narrow down the gender of the name-bearer. With the context being redeposited fillmasses at almost 3m below sea level, nothing can be deduced from its location either.

INS424 provides insight into the political machinations of the time and mentions an Ólafr, presumably a contender for the Norwegian throne, which fits nicely with his idionym indicating high status.

The next-most-often used NH-idionym in this group is *Sigurðr,* appearing three times and once in connection with another NH-idionym, *Þorsteinn,* on INS152. This object, while not identified as such, appears to be an owner's tag, making one wonder why two names were carved into it; a "twin" inscription, most likely also carved by the same person (Liestøl & Johnsen 1980-1990: 212), dates to period 4 (INS153). The other two Sigurðrs, judging by hand-carving, are not the same man; then again, considering the popularity of the idionym, that is hardly surprising.

While more NH-idionyms appear on objects with other idionyms than in the prior group, there is still a marked tendency for them to appear by themselves (Table 63). Although Table 58 illustrates that in several periods, more than half of the objects inscribed with runes do not, at the present state of knowledge, carry idionyms, it is apparent that signalling ownership was still an important factor in why runes were employed. That NH counts the most tokens (and inscriptions) is hardly surprising, but in combination with IH-idionyms, it appears that once more those of potentially high social status have left more of a mark in runic writing than those from the lower social scales (disregarding, for now, those idionyms for which no social status could be determined). Like IL, NL only features one token/inscription, the already mentioned Arnbjǫrg in INS297 (Figure 36).

Opposed to this is the group of six PSH-idionyms, adding yet more tokens to the high-status group (Figure 35). Three of them are feminine, *Sigríðr, Ingibjǫrg/Ingibiǫrg* and *Margrét(a),* only the last of which appears together with one of two PSL-idionyms on INS539, *Halli* (the other PSL-idionym is the potential *Þorkatla* on INS413). The other two, like the Ásas, appear by themselves. Women carrying idionyms with high-status connotations, based on these inscriptions, may well have been active rune-carvers/-users in Bjǫrgvin, although they, too, might have used them mainly to signal ownership considering that Sigríðr's object was potentially a needle.

Of the three masculine PSH-idionyms, two appear in the already discussed INS297, while *Bjǫrn/Biǫrn* gets an inscription by himself. No further information except a z-coordinate, putting depth of discovery at 1.45m is available and none of the other objects can be considered as originating from a primary context either.

Much like the IH-idionyms, objects carrying NH-idionyms distribute across most of the excavation area, resembling the distribution patterns of IH and PSH, although NH- and PSH-idionyms can be found further back than IH (Table 63). Very little can be said concerning differences in distribution between periods 2 and 3; in period 3, the idionym-carrying objects are more evenly spread across the whole area, but it is difficult to decide what that may be owing to.

In period 3, high-status idionyms regardless of country allocation make up the largest group, although the not inconsiderable number of idionyms currently without country/status-allocation should not be forgotten. Tokens of NH- and IH are almost at the same level. Surprisingly, the number of feminine idionyms rises considerably from period 2 to 3, with period 2 having two feminine tokens in total and period 3 counting potentially 9 feminine idionyms where social status can be assigned and a further 5 where it cannot (Tables 61 and 63). The feminine idionyms are also almost exclusively high-status idionyms in *DN*, raising the question of who these women might have been and why they suddenly become visible in runic inscriptions.

7.6.4 Period 4 (1198-1248)

69 objects date to period 4. They carry 128 tokens of 86 different idionyms belonging to potentially 114 individuals (Query C.70, C.71, Table 64 and figs. 37 to 39). 24 tokens on 18 inscriptions are classed IH-idionyms, of which three are feminine. As visible in Table 64 and fig. 37, most of them were retrieved in the front parts of the excavation, mostly in connection with caissons in the harbour area, although INS69, carrying *Brandr/Vébrandr,* found north of a common passage, may be from a primary context. However, the primary context being a common passage, the object may have been lost/thrown away just as likely as used there.

A few idionyms appear several times, for example *Arni,* counting six tokens on five inscriptions (INS58, INS62, INS472, INS512, INS350). Whether they refer to the same person must remain open, although considering the length of period 4 (50 years), they probably refer to different men, possibly Icelandic long-distance traders (page 115), although the second character sequence on INS62 likely reads *Arni* as well and references the same person. This, and the tokens on INS472, INS512, are not identified with certainty, so perhaps the count of tokens is actually lower than suggested here.

The choice of one normalisation over the other results in a shift in interpretation, since the alternatives are not only different idionyms, but also change the gender of the name-bearer from male to female. Particularly in the case of INS472, the feminine idionym is a likely alternative since the inscription also sports two other feminine idionyms and *Sigurðr*. Again, that raises the question of why these idionyms would appear on the same object; was it a customer list, a list of debtors, an overview of someone's tenants or perhaps even the beginnings of a guest list for some social event?

Similar considerations concern INS304, which in addition to the feminine IH *Þorbjǫrg* carries four masculine idionyms, one or two of which are NH. Again, a feminine idionym appears in conjunction with masculine idionyms, a phenomenon already observed in period 3. It recurs on INS382, INS384, INS110, INS412 in period 4 (on condition that the feminine normalisation is correct). Numerous occasions in daily life can require writing down a

Table 64. *Overview of idionyms and classification of objects dating to period 4, see Figures 37 to 39. Count of tokens and social status of single idionyms noted in brackets. Variations in idionym-identification indicated by " / " between the options. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in* ***bold****.*

Row	Unit	Inscription	Idionyms	Object	Text tag
Bugården	K11	ins111	Munán	owner's tag, PN, trade	
	K12	ins77	Eiríkr (NH)		owner's tag, trade
	L11	ins147	Þórhallr (IL)		owner's tag, trade
	L12	ins106	Ívarr (NH)		owner's tag, trade
		ins249	Gunnhildr (f)		comment, learned, love, mnemo-device, poetry, pub environment, quote
	N12	ins350	Arni (IH), Áslákr (NH), Bárðr (NH), Bjarni/Biarni, Einarr (PSL), Erlendr (IH, 2), Finnr (IH), Hallkell (PSH), Hávarðr (NH), Hrólfr (Rolfr) (NH), Ívarr (NH), Jón (PSH, 2), Kolbeinn (IH), Kolbjǫrn (NH), Ólafr (NH, 2), Sigurðr (NH, 3), Styrkárr (PSL), Þórðr (NH), Þórir (NH) / Þórr (2), Þormóðr (PSH)		
Engelgården	I09	ins72	Einarr (PSL)		owner's tag, trade
	K09	ins101	Halldórr (NH), Kárr (IH)[6]		owner's tag, trade
		ins110	Grímr[7], Lúcia (f)		owner's tag, trade
		ins116	Ormríkr		owner's tag, PN, trade
		ins153	Sigurðr (NH), Þorsteinn (NH)		owner's tag, PN, trade
		ins278	Þorgunna (f)	part of a cross	
		ins94	Guðmundr (PSH)		owner's tag, trade
		ins97	Gunnarr		owner's tag, trade
	K10	ins114	Ormr		owner's tag, trade
		ins269	Gyða (f)		comment, pub environment
		ins63	Ásgeirr		owner's tag, trade
		ins92	Gísl (IH)		owner's tag, PN, trade
	L09	ins109	Ljótr/Liotr (IH)		owner's tag, trade
		ins121	Sámr	with hole	owner's tag, trade
		ins122	Sámr		owner's tag, trade
		ins273	Án(n) / Anna (f, IL)		
		ins283	Þórir (NH)		
		ins290	Eindriði (IH)		
		ins68	Bótleifr		owner's tag, trade
		ins70	Búi (IL) / Búr-Almarr		owner's tag, trade
	L10	ins79	Eiríkr (NH)		owner's tag, trade
	M09	ins85	Eyjolfr/Eyiólfr (IH)		owner's tag, trade
Søstergården	K07	ins115	Ormr		owner's tag, PN, trade
		ins123	Sigbaldr / Sigbaldi / Sigvaldr		owner's tag, trade
		ins369	Símon (NH)		
		ins410	Þóri	human-like figure, sculpture	
		ins62	Án(n) / Arni[8] (IH), Arni (IH)		owner's tag, PN, trade

[6] Occurring as a patronym.
[7] Occurring as a patronym.
[8] Markali 1983 notes these two possibilities.

Table 64. *Overview of idionyms and classification of objects dating to period 4, see Figures 37 to 39. Count of tokens and social status of single idionyms noted in brackets. Variations in idionym-identification indicated by "/" between the options. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in **bold**.*

Row	Unit	Inscription	Idionyms	Object	Text tag
	K08	ins151	Þormóðr (PSH)		owner's tag, PN, trade
		ins304	Heðinn, Þóraldi (NL) / Þóraldr (NH), Þorbjǫrg (f, IH), Þórir (NH)		
		ins99	Gunnarr		owner's tag, trade
	L07	ins49	Þorkell (NH)		følgeseddel
	N07	ins73	Einarr (PSL)		owner's tag, trade
	O06	ins497	Únás(s)		
Gullskoen	K05	ins98	Gunnarr		owner's tag, trade
	K06	ins124	Sighvatr (IH) / Sigvaldr		carver formula, owner's tag, trade
		ins132	Sǫlveig (f, IH)		owner's tag, trade
		ins373	Þorleifr (PSH)		
		ins382	Bergþóra (f) / Bergþórr (IH), Erlingr (NH)		
		ins384	Eiríkr (NH), Guðrún (f, NH), Sigríðr (f, PSH)		
		ins388	Þorgils/Þorgísl (NH)		
		ins425	Þorbjǫrn (NH)		
		ins426	Ólafr (NH)		
		ins58	Arni (IH)		owner's tag, PN, trade
	L05	ins119	Ragnarr (IL)		owner's tag, trade
		ins412	Guðríðr (f, IH) / Gyrid, Ívarr (NH)		
		ins81	Eiríkr (NH)		owner's tag, trade
		ins91	Finnr (IH, 2)		owner's tag, trade
	L06	ins102	Hallgísl/Hallgils		owner's tag, trade
		ins144	Þorgils/Þorgísl (NH)		owner's tag, trade
		ins148	Þórir (NH)		owner's tag, trade
		ins418	Steinarr (NH)		
		ins419	María (f)		
	M05	ins472	Áni / Anne (f) / Arni (IH), Gyða (f), Rannveig (f), Sigurðr (NH)		
	N03	ins512	Áni / Anne (f) / Arni (IH)	part of wooden disk, spade	
		ins518	Samson		
	N04	ins516	Þorbergr (IL)		
	N05	ins104	Ió(h)an/Jó(h)an (PSH)		owner's tag, PN, trade
	O03	ins534	Benedikt (IH) / Benedikta (f)		
	O04	ins535	Óttarr	nail?	
	O05	ins478	Ió(h)an/Jó(h)an (PSH), Sigurðr (NH)		learned, letter, period context
		ins492	Auðun (NH), Þórðr (NH)	part of a hammer (bløyg?)	
	P03	ins126	Sigríðr (f, PSH)		owner's tag, trade
	P05	ins69	Brandr (IH) / Vébrandr (PSL)		owner's tag, trade

list of names including both genders and guessing at the background behind these particular ones is likely a futile endeavour. Heðinn from INS304 may only have been looking to practise his skills by carving the names of people he knew. However, it is interesting that the IH-idionyms now occur so frequently in combination with idionyms from the other categories (Table 64), although there are still several objects on which they are the only ones. Are Icelanders becoming more involved in the goings-on in Bjǫrgvin? Are they immigrating back to Norway? INS101, carrying another example of what could be the result of an Icelandic-Norwegian marriage, could point in the same direction (page 114). All things considered, though, there is too much uncertainty regarding especially the geographical aspect of Category-1a-idionyms to assume anything the like (see Section 5.7).

The last *Arni*-token from this period appears on INS350 in a list of masculine idionyms spanning almost the whole range of categories except IL and NL. This list does not include a feminine idionym, but more tokens of IH-idionyms, *Erlendr, Finnr, Kolbeinn*. Again, it was interpreted as a counting up of the whole crew of a ship (Liestøl 1964a) and if correct, it strikes one that almost all of the idionyms can be considered high-status in their respective groups. Or should this rather be considered as a sign that these idionyms were also popular amongst all social levels? Or does this have anything to do with the rise in status of rich merchant families and the aristocracy taking an interest in trade (Section 7.6.8)?

If this inscription refers to a joint business venture or the crew of a ship, not only was it possibly "bi-national", but the members of it were potentially of fairly high social standing, even considering the two low-status and the one non-status-associated idionym. Considering that a *félag* generally only includes two partners (Wieske 2011: 98), other interpretations than a crew list could also be taken into consideration; a list of supporters for one of the political factions of the time? A list of trust-worthy allies living/trading in Bjǫrgvin? Historical sources state that the townspeople had their own opinions concerning the various contenders for the Norwegian throne; they could and would support their favourite candidate even if the opposing faction was currently holding the town (Helle 1982: 156-157). Presumably, the powers that be would therefore have a keen interest in knowing just who they might turn to when in need of support or who to stay away from.

This is far from even being a hypothesis and can by no means be proven, regardless of what the social status of the idionyms or INS424 may seem to imply. It should merely be understood as a thought experiment, a suggestion for why a person might feel the need to note down so many names of men who may have wielded power of some sort; period 4 certainly encompasses a turbulent time in Norwegian history.

Despite so many of the IH-idionyms appearing in inscriptions listing more than one idionym, 10-12 objects only carry one IH-idionym (depending on whether two tokens of the same idionym refer to the same person), indicating that while runes during period 4 were apparently increasingly used to compose lists of names for whichever purposes, signalling ownership remained a reason for making use of runes amongst those carrying IH-idionyms. In terms of distribution across space, the period 4 IH-idionyms cluster in the front part of the excavation, mostly the waterfront (Figure 37), whereas in periods 2 and 3, they spread relatively evenly across the map (Figures 34 and 35). The purpose of inscriptions carrying IL-idionyms appears much clearer based on the fact that three use the verb *á,* "owns". INS119 even clarifies that Ragnarr's ownership concerns certain threads, whereas the others have (sadly) not felt the need to elaborate. Þorbergr, however, informs readers that it was him who carved these runes.

Compared to the two prior periods with only one IL-idionym each, the count has risen, and the objects were found mostly in the middle and towards the waterfront (Figure 37). With only one example from periods 2 and 3 and five from 4, statements about changing distribution patterns cannot be made. None of the objects were identified as anything but a rune-stick either, so presumably these inscriptions were meant to serve as owner's tags or a writing exercise.

The group of NH-idionyms counts 40 tokens on 23 objects (Table 64 and fig. 38). Only one of them, *Guðrún* on the already mentioned INS384, is

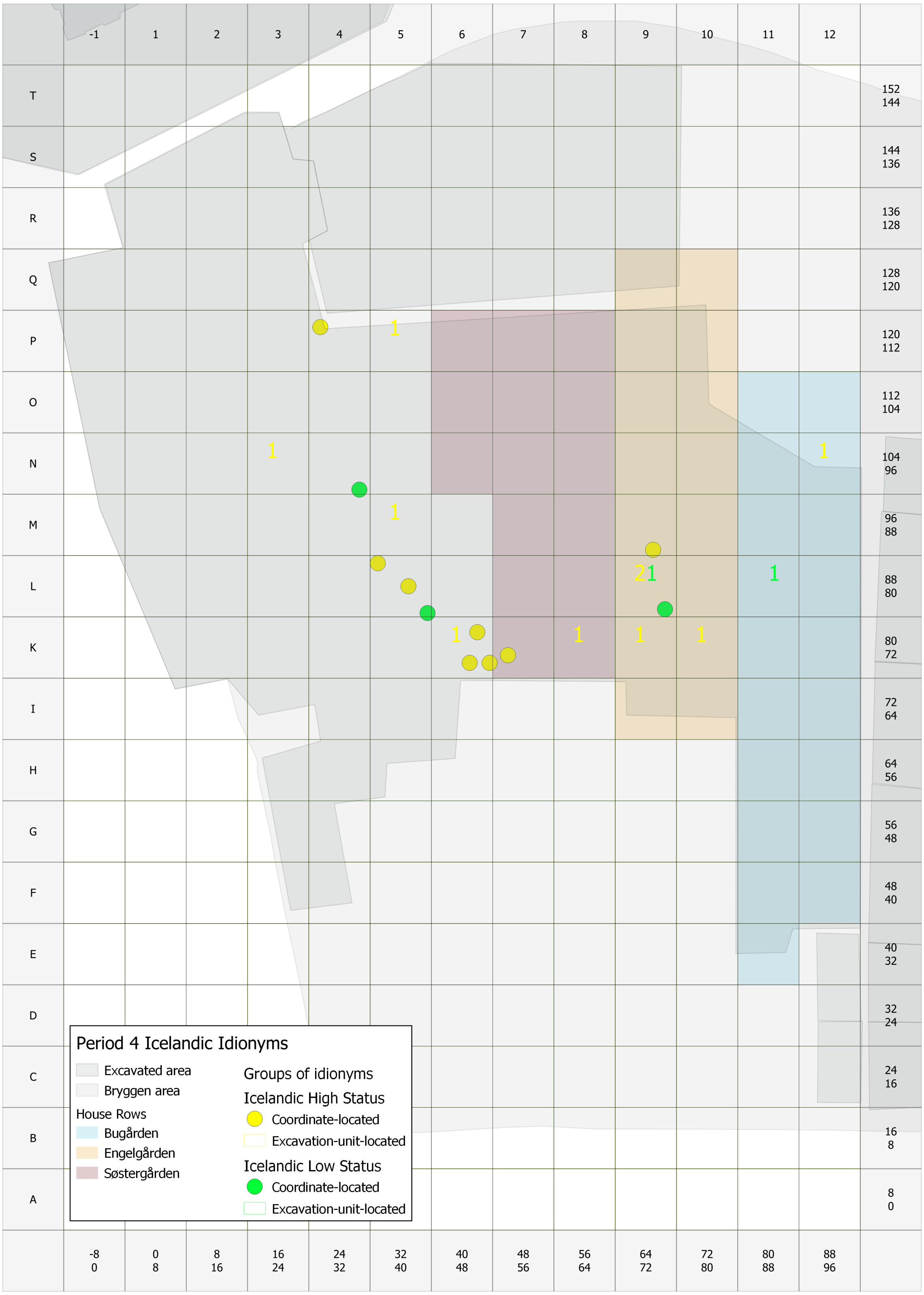


Figure 37. *Distribution of Icelandic high- and low-status idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 4.*

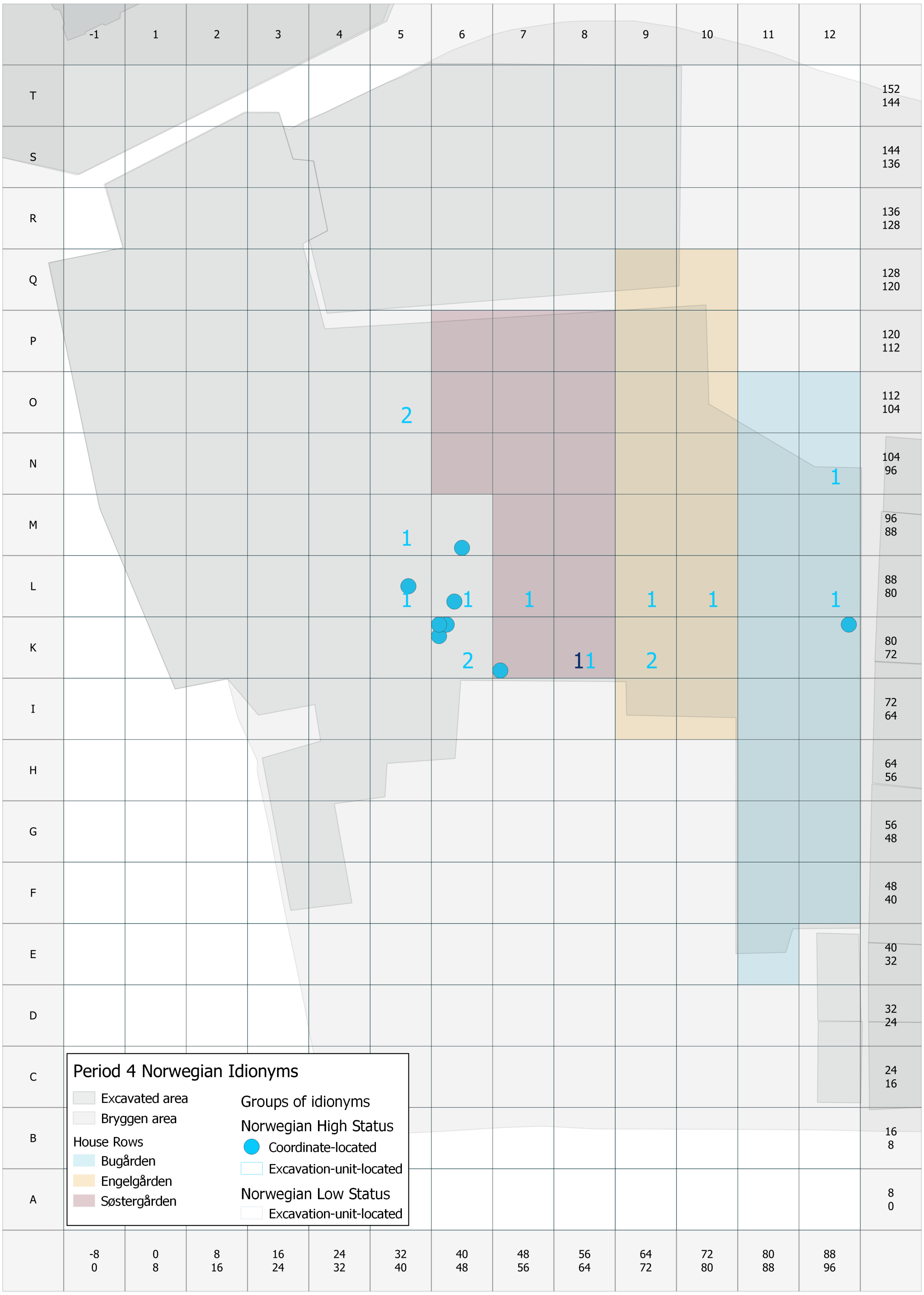


Figure 38. *Distribution of Norwegian high- and low-status idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 4.*

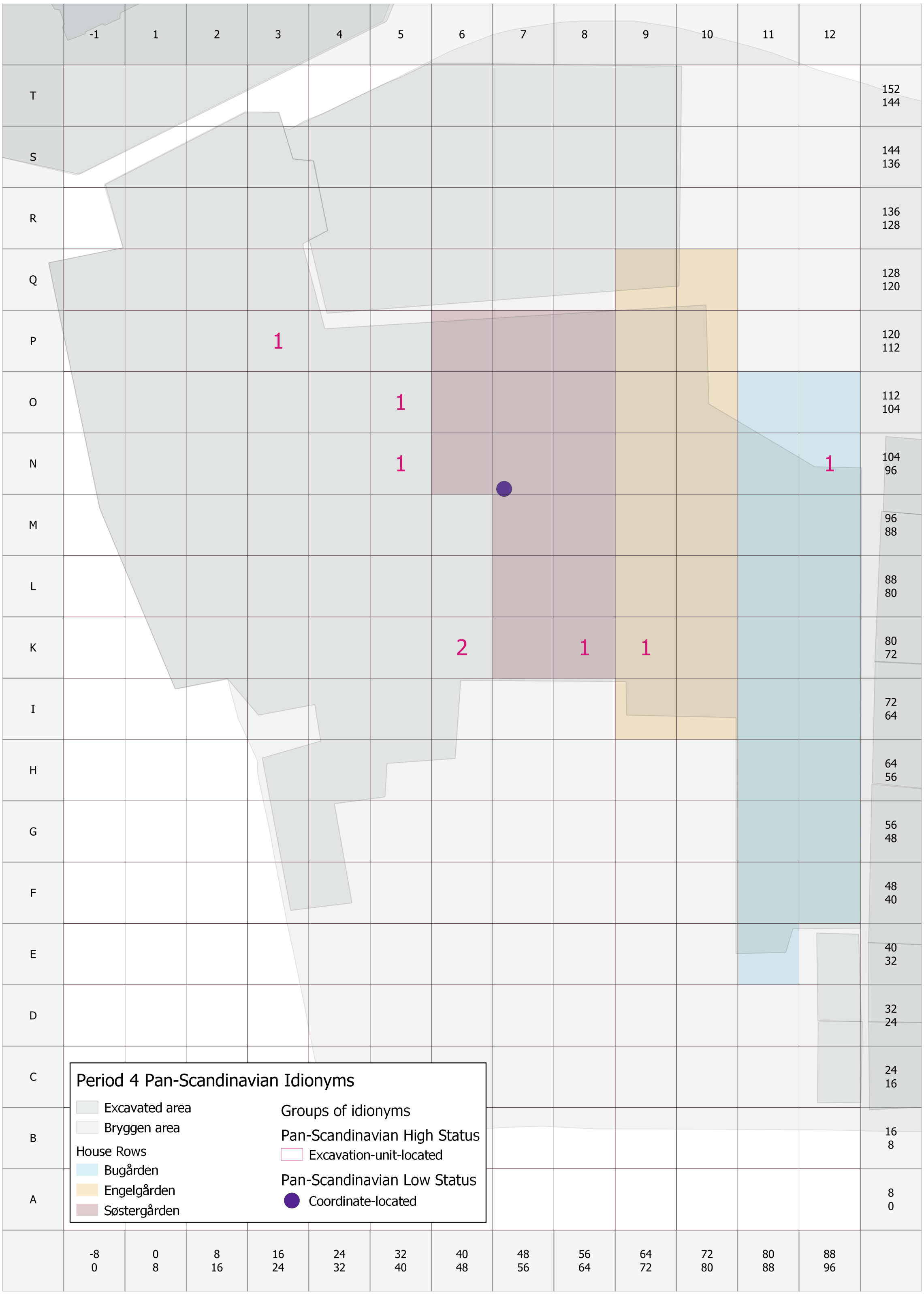


Figure 39. *Distribution of Pan-Scandinavian high- and low-status idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 4.*

feminine, and appears with *Eiríkr* (also NH) and a feminine PSH-idionym, *Sigríðr*. Since name lists were discussed above, it should suffice to note that once more, all idionyms appearing in the inscription in question sort into the high-status groups. Provided the masculine normalisation of the idionym is the correct solution, INS382 offers another instance of IH-idionyms appearing together with NH-idionyms, although the purpose of this inscription is unclear; the same goes for INS304, although in this case, the IH-idionym is feminine.

The twin of INS152, carrying another token of *Sigurðr* and *Þorsteinn,* is dated to period 4, raising the question of whether one of these objects was dated to the wrong period or the two men in question just happened to be active in Bjǫrgvin before and after the fire. As far as the inhabitants were concerned, the fires were short-term events meaning a nasty disruption of their daily lives and routines, not a cut-off point. People survived these fires, rebuilt and commenced their usual activities at the earliest possible opportunity. With no evidence that the two objects – which also look very much alike – are dated to the beginning of period 3 and the end of 4 respectively, which would separate them by at least 70 years, there is therefore more reason to assume that these two men represent the (presumably large) group of inhabitants whose lives and usual activities were interrupted by the fire and who returned to rebuild. Since both idionyms are NH, they might have been locals rather than traders who only occasionally visited, although the objects being owner's tags could mark them as traders living in other areas of Norway.

Once more, ownership and business correspondence appear predominant topics in this group. OWN *á* frequently occurs and 14 objects carry only one idionym, although not all of them necessarily indicate ownership. INS49, for example, bears witness that one Þorkell sent someone pepper. Once more, the majority are only classed as rune-sticks, so presumably did not serve any purpose beyond being an inscription carrier.

INS478 is the (in)famous order for weapons or ships by the crown prince (page 129), while INS492 was carved into what might have been part of a hammer; all the more mysterious because two NH-idionyms appear on it, *Auðun* and *Þórðr,* rendering ownership marking questionable. *Þórðr* is dithematic, consisting of *Þór-* and *-røðr*, therefore part of the group of idionym referencing the god Þórr (Janzén 1947c: 95).

Two contexts could potentially be primary, INS77 and INS81, although both were found in a thoroughfare, so even if the context is indeed primary, they could have been lost there. Interestingly, they both carry the idionym *Eiríkr* and if both inscriptions refer to the same man, he could have lived along the passage in question; one object was found in K12 and the other in L05, though, a fair bit apart. Most likely, the inscriptions have nothing to do with each other.

Much like the IH-idionyms, the objects carrying NH-idionyms are found mostly close to or at the waterfront (Figures 37 and 38). It also appears that the NH-carrying objects have shifted from the left to the right side of the excavation area. There are not enough data points for NL-idionyms, of which there is only one in period 4, just like in the preceding periods, especially since the normalisation is uncertain (INS304).

Eight objects carry inscriptions with nine PSH-idionyms, two of them feminine: *Sigríðr* in the already mentioned INS384 and another in INS126, where the idionym appears by itself. It is the only object to be found in a lavatory, into which it may have been thrown after it had fulfilled its purpose as an owner's tag. Of the group, four idionyms appear alone, the others always group with NH-idionyms. In comparison to periods 2 and 3, PSH-idionyms distribute more evenly, although given the larger number of inscriptions dating to this phase and its longer duration, this does not have to mean anything. What apparently remains the same is that about half of them are found along the waterfront, while the other half was discovered in excavation units at the rear end of the house rows (Figure 39). The same cannot be observed for NH- or IH-idionym (Figures 37 and 38), neither does it hold true for PSL, which only has four objects carrying five PSL-idionyms, provided *Vébrandr* is the right normalisation for INS69. Three of the other four are *Einarr,* although their appearance on three different objects renders it unlikely that they refer to the same man. The last one is *Styrkárr,* appearing on INS350 together with one token of *Einarr*. There is no preference for the rear, middle or waterfront parts, but the nature of their contexts still suggests redeposition (Figure 39).

Like in periods 2 and 3, high-status-idionyms have more individual tokens than the low-status-groups, with a substantial count of idionyms with no social-status-association. Interestingly, idionyms now appear to group according to social status; one look at Table 64 shows that quite a few of the undefined tokens stand by themselves, while especially the high-status-idionyms frequently appear side-by-side in lists, in which case idionyms of both genders are often combined as well. It is difficult to draw any conclusions regarding the purpose of those lists other than that idionyms associated with high social status dominate the material.

7.6.5 Period 5 (1248-1332)

In period 5, 82 idionyms counting 105 tokens appear on 56 objects, possibly referring to 94 individuals (Query C.70, C.71, Table 65 and figs. 40 and 41). Most of them are simply classed as "rune-stick". 18 are IH, one of which is feminine, *Þorbjǫrg*. It appears with three masculine idionyms on INS304; other than in period 4, most of the IH-idionyms now stand by themselves in inscriptions. Not counting INS304, they appear with other idionyms in only three instances, INS40 (possibly an invocation), INS53 and INS549. Theoretically, INS304 also belongs to this group, but dating being uncertain, it was already discussed (page 181).

INS53 and INS549 are lists, with INS53 almost certainly counting up debts. Apart from the idionym of the potential signatory Vígi, all listed idionyms belong to high-status groups and so do most of the idionyms on INS549, although in one case the right normalisation might be either undetermined or NL. This follows the trend already observed in period 4. INS566 only shows two idionyms, so is hardly a list, but also here, an IH-idionym appears with an NH-one. Again the group includes several objects carrying *á,* thereby recognisable as owner's tags. Three objects breaking the pattern of either being classed as rune-stick or owner's tag are INS40, a cross possibly used for private worship (Liestøl & Johnsen 1980-1990), INS566, which mainly differs in material (stone), and INS231, identified as a toy boat and carrying *Illugi*, which sorts into IH. Since the object is a toy, it is much harder to accept that Illugi was merely paying Bjǫrgvin a visit; a very tentative conclusion could be that Illugi may have been the result of an Icelandic-Norwegian marriage. The majority of the objects are now found in the eastern/right half of the excavation area and closer to the waterfront (Figure 40).

Only four idionyms dated to period 5 are IL, and in the case of INS71, INS141, INS56, they may be normalised as other idionyms (Table 65). While for INS71, INS56, the alternatives are idionyms without status association, the alternatives for INS141 indicate a Norwegian of either high or low social status; a decision cannot be made, nor can the object serve to support an argument. The only inscription without doubts about the idionym is INS328, and this particular instance possibly does not refer to an actual person. Considering these complications, and while the distribution is mapped in Figure 40, there is little point in attempting to read anything into the distribution pattern.

Again, most tokens in period 5 are NH, counting 36 tokens on 30 objects (Figure 41), two of which are feminine, INS216 *Ása* and INS239 *Jórunn/Iórunn*. Either appears in a list, *Ása* with a masculine and a feminine PSH-idionym, while *Jórunn/Iórunn* is grouped with three more feminine idionyms, one PSH and the other two non-status-associated. Considering there was no lack of Ásas in period 3, it is surprising that the idionym appears to skip period 4 completely and then only appears once in 5. There is too little evidence to draw conclusions along the lines of the idionym falling out of favour; it is much more likely that either fewer women were active on Bryggen in period 5 or that the evidence was destroyed.

Period 5, however, yields an important find regarding the question of women in Bjǫrgvin: the only list composed of only feminine idionyms, INS239. In addition to NH-*Jórunn/Iórunn*, PSH-*Ingibjǫrg/Ingibiǫrg* and non-status-associated *Bóthildr, Hallkatla* appear. A customer list is once more an option, but the inscription was interpreted in full; it is therefore difficult to say anything more about it. A writing exercise is another explanation; perhaps one should also consider the notion that these lists could be an overview of servants

*Table 65. Overview of idionyms and classification of objects dating to period 5, see Figures 40 and 41. Count of tokens and social status of single idionyms noted in brackets. Variations in idionym-identification indicated by " / " between the options. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in **bold**.*

Row	Unit	Inscription	Idionyms	Object	Text tag
Bugården	G11	**ins157**	Ǫgmundr (IH)	owner's tag, tally stick	owner's tag, PN, trade
		ins200	Ió(h)an/Jó(h)an (PSH), Þjóðgeirr/Þióðgeirr, Þorgils/Þorgísl (NH) / Þorkell (NH)		
		ins207	Hafdjarfr	decorated with ships	
		ins209	Egill (IH) / Eygísl/Eygils		poetry
		ins216	Ása (f, NH), Jón (PSH), Sigríðr (f, PSH)		
		ins61	Arni (IH)		owner's tag, trade
	H11	ins204	Helgi (NH), Ólafr (NH)		
		ins215	Eiríkr (NH) / Herikr		
		ins60	Arni (IH)		owner's tag, trade
		ins67	Bjarni/Biarni		owner's tag, trade
		ins86	Eyjolfr/Eyiólfr (IH) / Þólfr (NH)		owner's tag, trade
	I11	ins40	Benedikt (IH), Margrét(a) (f, PSH)		
	K11	ins105	Ívarr (NH)		owner's tag, trade
	L12	**ins173**	Ió(h)an/Jó(h)an (PSH)	walrus skull	
Engelgården	K09	ins228	Lafranz (NH)		
		ins232	Ólafr (NH, 2)	lite kne	
		ins247	Þorfinnr (IH)		
		ins251	Inga (f), Ingiríðr (f, PSH)		
	K10	ins234	Auðr (mf)		bad, love
		ins53	Bárðr (NH), Heinrekr (PSH), Ingimundr (IH), Vigi (3)[9]		balance sheet, trade
	L09	ins150	Þorlákr (IH)		owner's tag, trade
		ins239	Bóthildr (f), Hallkatla (f), Ingibjǫrg/Ingibiǫrg (f, PSH), Jórunn/Iórunn (f, NH)		
	L10	ins158	Heinrekr (PSH), Ǫlrekr		owner's tag, PN, trade
		ins231	Illugi (IH)	toy boat	
		ins248	Þóra (f)		
	M10	ins566	Arni (IH), Eiríkr (NH)	runestone	
		ins76	Eindriði (IH) / Einri		owner's tag, trade
	I09	ins142	Þorbjǫrn (NH)		owner's tag, trade
	I10	ins16	Vilhelmus/Vilhiálmr (IH)		
		ins257	Gunnarr		
		ins71	Didrik (IL)/ Þiðrikr		owner's tag, PN, trade
Søster-gården	K07	ins339	Þórðr (NH, 2)		
	K08	**ins304**	Heðinn, Þóraldi (NL) / Þóraldr (NH), Þorbjǫrg (f, IH), Þórir (NH)		

[9] If this is indeed an idionym, it is likely to refer to only one individual.

Table 65. *Overview of idionyms and classification of objects dating to period 5, see Figures 40 and 41. Count of tokens and social status of single idionyms noted in brackets. Variations in idionym-identification indicated by " / " between the options. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in* ***bold****.*

Row	Unit	Inscription	Idionyms	Object	Text tag
Gullskoen	H05	ins154	Þorsteinn (NH)		owner's tag, trade
	I04	ins454	Guðmundr (PSH), Þorbjǫrn (NH)		
	I05	ins145	Þorgils/Þorgísl (NH)		owner's tag, trade
		ins447	Þóraldi (NL) / Þóraldr (NH)		
		ins448	Sigurðr (NH)		poetry
		ins455	Reiðarr		
		ins456	Hallvarðr (NH)		
		ins50	Eiríkr (NH), Sigurðr (NH)		comment, trade
	K04	ins131	Sægunni (f)		owner's tag, trade
		ins149	Þorkatla (f, PSL) / Þorkell (NH)		owner's tag, trade
		ins93	Guðmundr (PSH)		owner's tag, trade
	K05	ins325	Erlingr (NH)		
		ins331	Auðr (mf), Holmr, Kátr / Kattr / Kǫttr, Myttar, Tast		bad, learned, list, love, mnemo-device, poetry, quote
		ins335	Eysteinn (NH)	nail or bløyg	
		ins405	Loðinn (NH)		
		ins421	Gunnarr		
	K06	ins330	Arni (IH)		
	L05	ins328	Ími (IL)		
	M06	ins141	Þóraldi (NL) / Þóraldr (NH) / Þórhallr (IL)		owner's tag, PN, trade
	O04	ins56	Guðsteinn / Gunnsteinn (IL) / Gusir / Gussir, Sámr		følgeseddel, letter, unfinished
	O05	ins470	Guðþormr (PSH), Jón (2, PSH)		sex
	P05	ins90	Finnr (IH)		owner's tag, trade
	Q02	ins549	Birgir (NH)[10], Erlendr (IH), Helgi (NH)[11], Narfi (IH)[12], Sigurðr (NH), Þorfinnr (IH) / Þorgarðr (NL) / Þorviðr		

[10] Occurring as patronym.
[11] Occurring as patronym.
[12] Occurring as patronym.

connected to a certain household, or the names of tenants? Mygland (2023) lists various evidence for single women living in and renting rooms in houses on Bryggen, so this could be an explanation.

Many of the masculine NH-idionyms in Table 65 appear to be owner's tags, although they frequently appear in conjunction with other potential high-status-idionyms. Except for one list, INS549, recording the patronymics of the men alongside their names, there is nothing in particular that catches attention.

The combination of patronymics and given names, however, allows for speculation: Erlendr Birgissonr, Sigurðr Helgasonr and Þorfinnr/Þorgarðr/Þorviðr Narfasonr do not only carry given names potentially indicating high social status, but their fathers do as well. The trouble is that in the case of Erlendr, his given name currently sorts into IH, while the patronymic is NH. Depending on which normalisation is correct, Þorfinnr/Þorgarðr/Þorviðr Narfasonr presents a similar problem (page 114). Only Sigurðr Helgasonr shows no such contradiction.

There is no conclusive answer to the question of where exactly these men hailed from, although it might have played an important role when the inscription was carved. Period 5 starts after the 1248-fire, seven years after Snorri Sturluson was killed due to his quarrel with Hákon IV, who brought Iceland under Norwegian rule against Icelandic protests. Icelanders could not avoid Bjǫrgvin regardless of the political situation owing to its importance as a port. Perhaps two of the three men from INS549 were Icelanders with a Norwegian or Norwegians with an Icelandic background and had reason to be in Bjǫrgvin on account of politics. Why their names were noted down together is anyone's guess, although the location in Q02, almost at the very rear end of Gullskoen close to the church of St. Lawrence's at the back end of the properties under building 52 (Figure 41), may imply that this inscription was lost there rather than redeposited.

The overall distribution of NH-carrying objects both resembles and contradicts the IH-distribution, since NH-objects cover a larger area (Figures 40 and 41). They particularly appear to cluster in I-K 04-05 and H-G11. A single object was found in what can be considered a primary context, INS228 carrying *Lafranz* in building 368, again close to the Church of St. Lawrence, *Lafranskirken* in Norwegian. This is obviously the same *idio* the church's patron saint carries and it is therefore within the realm of possibility that the inscription refers to the patron saint and should be counted as an invocation. The object and the rest of the inscription are damaged, however, making it difficult to say anything with certainty. Markali (1983) gives **–]hurþrlslrþsrlafrazrrrþr?[–** as transliteration, *Rundatabas* **-hurþrlslrþsr lafranc r rr þr –**. The choice of separation already hints that *Rundatabas* considers only **lafranc** readable, but it should at least be mentioned that **-hurþr** could be the remnants of an original *Sigurðr*, broken in two when the object was damaged. If that is the case, then the object may have carried one of the aforementioned name lists, and the fact than an inscription carrying *Lafranz* was found close to the Church of St. Lawrence must not mean that the inscription had anything to do with the church.

The other NH-contexts are all redeposited and often from below sea level, where they likely ended up as redeposited fillmasses. The mostly inscription-free excavation units at the back (excepting Gullskoen), even where they have not been dug by mechanical diggers, are a familiar phenomenon and the pattern for the most part corresponds with the observations in period 4, although the units in question have shifted.

NL-idionyms appear on four objects, INS447, INS304, INS141, INS549 (Figure 40). Like the IL-idionyms, their normalisations are not certain; they could also be N/IH-, IL or non-status-associated idionyms. If their normalisation as NL-idionyms is correct, two appear by themselves and the other two in lists. Again, the numbers are too low to be talking about patterns.

PSH-idionyms are, once again, the third-largest group by count of token with 11 on as many objects (Table 60 and fig. 40). Three of them are feminine; INS216 and INS239 were already discussed in relation to their associated idionyms. *Margrét(a)* appears on INS40, the same cross as *Benedikt;* it may be an invocation. Of the seven masculine PSH-idionyms, only INS93 *Guðmundr* and INS173 *Ió(h)an-/Jó(h)an* appear by themselves, while INS158, *Heinrekr* keeps company with *Ǫlrekr* and possibly in-

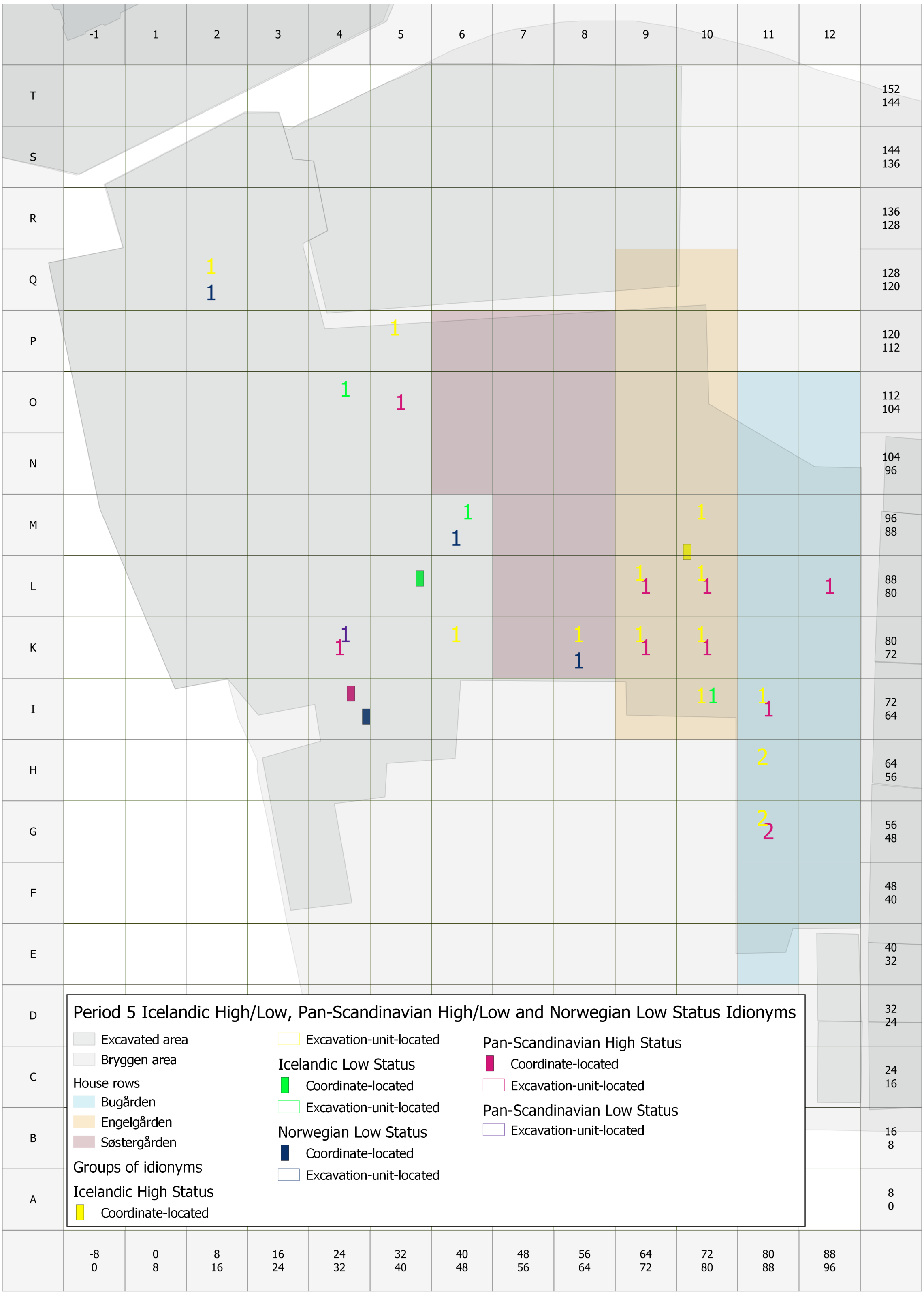


Figure 40. *Distribution of different groups of idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 5.*

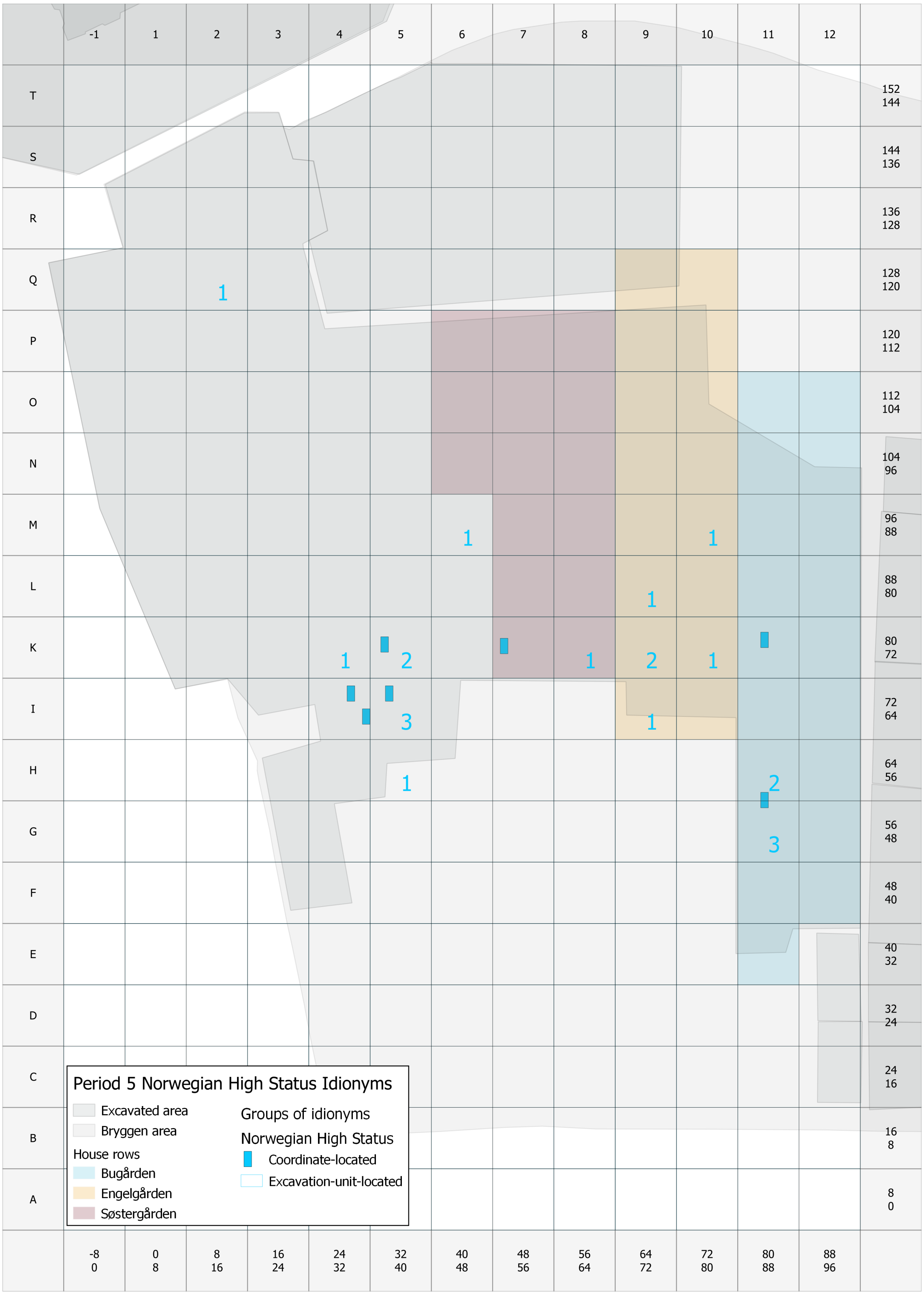


Figure 41. Distribution of Norwegian high-status idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 5.

dicates a foreigner (Table 65). INS470 carries three PSH-tokens, *Guðþormr* and two times *Jón*. This is interesting, as the high-status-idionyms generally mix in lists and this inscription is tagged with "sex" (Section 6.3.5). Similar to IH-idionyms, the objects carrying PSH-idionyms cluster close to the waterfront (Figure 40). One object in particular needs to be mentioned: INS173 *Jó(h)an/Jó(h)an* was carved into a walrus skull. Most likely this, too, is an expression of ownership, although what the purpose of keeping the skull was, must remain an open question. Since the skull was also decorated, perhaps it could have been a sort of trophy?

PSL has only one token, *Þorkatla* on INS149, and again the normalisation is doubtful (Figure 40).

The distribution of idionyms dating to period 5 shows, once more, a dominance of potentially high-status-idionyms, with NH leading, IH coming in second and PSH third in terms of tokens. This has not changed in comparison to the preceding periods, but the spatial distribution has, with IH and PSH moving more towards the right side and clustering closer to the waterfront and NH generally distributing more evenly on the east-west axis (Figures 40 and 41). The empty units at the rear of the excavation prevail with a few exceptions in Gullskoen. It is difficult to gauge whether that may be due to the mechanical diggers going deeper than intended in some areas or whether this is due to more fillmasses ending up in the caissons due to increased building activity and the longer duration of period 5.

7.6.6 Period 6 (1332-1413)

24 idionyms counting 28 tokens appear on 19 objects in period 6, three of which are feminine (Table 66 and fig. 42). They potentially denote 28 individuals.

Five tokens are IH; *Kolbeinn* appears twice in INS258 and may refer to the same man. *Erlendr* and *Yngvildr* appear by themselves on INS460 and INS214 while *Hákon* shares INS404 with the non-status-associated *Gunnar* and PSH-*Jón*. According to Liestøl (1964a: 11, 1968: 25), these three men can be identified by way of their bynames, even if the inscription text itself likely mocks them (page 128). Potentially Icelandic rune-carvers in period 6 are Kolbeinn, Erlendr and Yngvildr. INS460 was found in a possible primary context underneath a passage covering in N04 according to the unit reference, however, as is visible in Figure 42, the coordinates locate it at 32x/95y, thereby actually M04 (see Table 66). The inscription, perhaps an owner's tag, may have been lost there, possibly as goods Erlendr owned were transported to or from storage, or it could have been thrown away. Neither INS214 *Yngvildr* nor INS258 *Kolbeinn* are identified further; they were found respectively in Bugården close to the waterfront and The other four IH-inscriptions are much closer to the waterfront, although four inscriptions do not a pattern make. Period 6 is also one of the phases where mechanical diggers were employed in many units, so many finds were lost; any observable patterns are even less reliable than those in other periods.

Only INS463 *Vémundr* from IL dates to period 6, in connection with *á*, indicating an owner's tag. It was found in M06 (Figure 42) underneath a passage, the same kind of potentially primary context as before, suggesting it may have been lost during transport or thrown away after use.

Eleven NH-tokens on eight objects date to period 6; INS200 carries two tokens, alternatives for the same character sequence in yet another list. The same applies to INS51, where *Gunnarr* and *Ǫgmundr* appear with *Helga/Helgi*. Either is categorised NH, so it is merely a question of gender. Considering that the other two idionyms are masculine, *Helgi* might seem more likely, but other objects show masculine and feminine idionyms in the same list. There is therefore no reason to prefer the masculine over the feminine normalisation. INS440, *Sigurðr* is carved into a handle, possibly also meant as a sign of ownership. Conversely, INS220 was carved into a wooden splinter, indicating perhaps boredom as the primary carving motivation.

No NL-idionym is dated to period 6 (Table 60), although both IL and PSL are present, even if their numbers are low.

Yet five PSH-idionyms appear on five objects, one of which is feminine *Ingibjǫrg/Ingibiǫrg* (by itself) on INS531 (INS173 was discussed in period 5). All of the contexts are redeposited. Figure 42 shows that the objects are found in vastly different areas, with any patterns likely strongly influenced

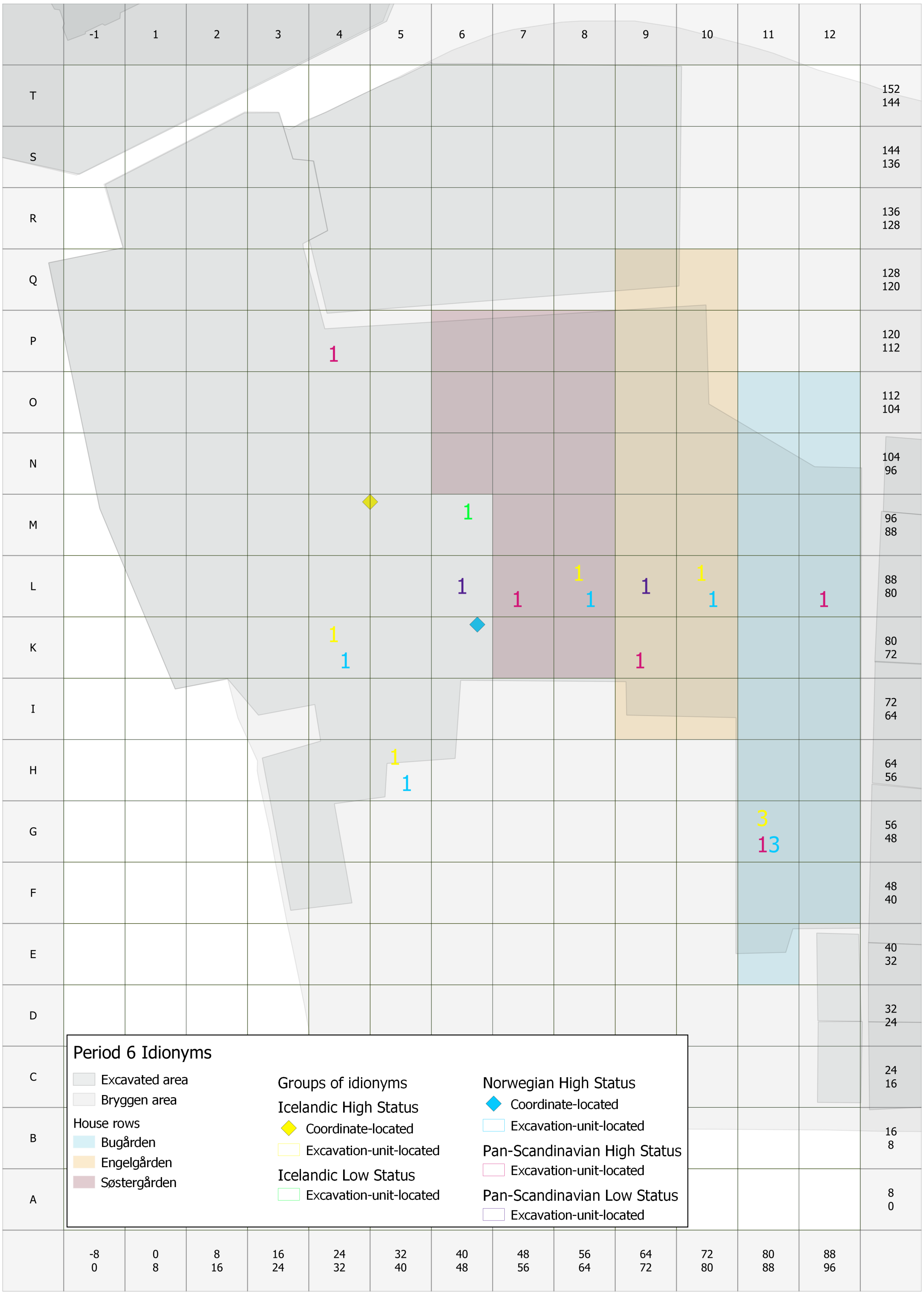


Figure 42. *Distribution of different groups of idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 6.*

Row	Unit	Inscription	Idionyms	Object	Text tag
Bugården	G11	ins107	Karl (NH)		owner's tag, PN, trade
		ins157	Ǫgmundr (NH)		owner's tag, PN, trade
		ins200	Ió(h)an/Jó(h)an (PSH), Þjóðgeirr/Þióðgeirr, Þorgils/Þorgísl (NH) / Þorkell (NH)		
		ins214	Yngvildr (f, IH)		
	L12	**ins173**	Ió(h)an/Jó(h)an (PSH)	walrus skull	
Engelgården	K09	ins5	Jón (PSH)		
	L09	**ins223**	Halli (PSL)	part of wooden vessel	
	L10	ins117	Pálni		owner's tag, trade
		ins220	Þórir (NH)	wooden splinter	
Søstergården	L07	ins404	Gunnarr, Hákon (IH), Jón (PSH)		letter, period context, unfinished
	L08	**ins256**	Hallvarðr (NH), Hávarr		
		ins258	Kolbeinn (IH, 2)		
Gullskoen	H05	ins51	Gunnarr, Helga (f, NH) / Helgi (NH), Ǫgmundr (NH)		følgeseddel, not interpretable, trade
	K04	ins440	Sigurðr (NH)	handle	
	K06	ins307	Bótolfr (NH)		
	L06	ins324	Einarr (PSL, 2)		
	M04	ins460[13]	Erlendr (IH)		
	M06	ins463	Vémundr (IL)	fløytel, granfløtt	
	P04	ins531	Ingibjǫrg/Ingibiǫrg (f, PSH)		

Table 66. *Overview of idionyms and classification of objects dating to period 6, see Figure 42. Count of tokens and social status of single idionyms noted in brackets. Variations in idionym-identification indicated by " / " between the options. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in* ***bold****.*

[13]Unit information places this object in N04 instead.

by mechanical diggers and the overall smaller number of finds from this period.

As mentioned, INS200 carries a list of masculine idionyms, one of which is categorised NH. INS404, also mentioned, is a prime example for the identification of the actual name-bearers indicating Norwegians regardless of country allocation, although their high social status, in this case, is

Row	Unit	Inscription	Idionyms	Object	Text type
Bu-gården	L11	ins155	Þorsteinn (NH)		owner's tag, trade
Engel-gården	L09	**ins223**	Halli (PSL)	part of wooden vessel	
Søster-gården	L08	**ins256**	Hallvarðr (NH), Hávarr		
Gull-skoen	K04 K05	ins47 ins322	Lunaney (f), Ótto (NL) Gunnarr		letter, trade

Table 67. *Overview of idionyms and classification of objects dating to period 7, see Figure 43. Count of tokens and social status of single idionyms noted in brackets. Variations in idionym-identification indicated by " / " between the options. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in* ***bold****.*

beyond doubt. INS173, the walrus skull, was discussed already, and the last token, *Jón,* appears by itself on INS5. Three of the five objects carrying PSH-idionyms were therefore some sort of ownership marker, one a list and the last an unfinished letter.

Only three PSL-tokens are dated to period 6, two times *Einarr* on INS324 and *Halli* on INS223 (both masculine), found close to the waterfront in L06 and 09. The *Einarr*-tokens presumably refer to the same man, especially since the byname corresponds. Conversely, Halli is carved into part of a wooden vessel, presumably also as an ownership declaration.

Trends apparently continue: idionyms appear either by themselves, probably as ownership markers, or in combination with other potential high-status-idionyms in lists. Yet no inscription in period 6 combines IH and NH, only the combinations NH/PSH or IH/PSH appear. Considering the much smaller number of inscriptions retrieved, that might not mean anything, and the same applies to the pattern observable in Figure 42, which shows objects carrying NH-idionyms exclusively at the front of the excavation area with one cluster in Bugården. With the removal of many parts of the layer by mechanical digger, what evidence there might have been was lost and the remaining objects indicate no substantial changes compared to prior periods. Most objects were discovered close to or directly at the waterfront, only one object towards the rear in P04.

7.6.7 Period 7 (1413-1476)

Only five objects carrying seven idionyms potentially indicating seven individuals appear in period 7. One of them is feminine, the (perhaps foreign or of mixed background) *Lunaney,* whose name appears in connection with another foreign idionym, *Ótto.* While the idionym is most likely German in origin (Johnsen 1987: 723), it was apparently used frequently enough in Norway to appear in NL. Two objects, INS256, INS223 could also be dated to period 6, where they were discussed.

INS155 is the only (more or less) certain NH-idionym, in combination with the already mentioned *Lunaney, Ótto* and the non-status-associated *Gunnarr.* If INS256 dates to 7 rather than 6, then two NH-idionyms, one NL- and one PSL-idionym appear. There are so few inscriptions from this period though that it is hard to say anything more but that the majority is masculine, more idionyms appear by themselves and inscriptions mentioning more than one individual date to it as well. Judging by the content of the inscription, Lunaney was perhaps a wife or landlady on Bryggen capable of conducting business on behalf of her husband/tenant (Liestøl & Johnsen 1980-1990: 111-112). The inscription is interesting since it puts a woman in a trading/business context, although whether Lunaney was asked to do so on a regular basis or only infrequently is not clear.

With only five objects and one of them carrying a non-status-associated idionym, looking for patterns is moot, although Figure 43 shows the distribution.

7.6.8 Merchant rune-carvers?

The preceding survey may leave in the impression that using runes in Bjǫrgvin was to a great extent tied to being part of a group holding comparatively high social status. This shall be discussed briefly before moving on to the last part of the analysis. As mentioned elsewhere (for example Sections 5.2, 5.3 and 6.4), the corpora used for the comparison are diplomas written in Latin/OWN for and by a certain part of medieval society. Since it is rather difficult to properly pinpoint who would have belonged to that part of society and which social status they would have held in the eyes of their contemporaries, "social status" in here is also fairly vaguely defined – a problem impossible to avoid on account of the lack of studies analysing the potential social status of those mentioned in the diplomas. It is generally accepted that from the 10th/11th century onwards merchants gained not only in wealth, but also in political influence and social status to the point where they were regarded as a distinct social group (for example Loveluck 2013; Hirschmann 2016; Carocci 2011). It is tempting to consider the runic inscriptions as evidence of this or more precisely: as indicators for the upwards social mobility of merchants.

There are, however, two problems with using the runic inscriptions as evidence for both merchants and upwards social mobility of this group. One is the current state of research into upwards social mobility of specifically Norwegian/Icelandic traders/merchants. While not the primary focus of his work, social background and (potential) mobility of merchants are discussed in Wieske (2011: specifically 55-88). Johnsen (1987), too, discusses the social background of merchants, but it is never quite clear who she considers part of the "merchant" group; once she mentions that testimonies by the traders themselves are lacking (Johnsen 1987: 734), then conversely writes that those levels of society in need of some sort of script used runes and also quotes INS478 while arguing that the crown prince was not part of the mercantile group on Bryggen (Johnsen 1987: 717, 726). Other authors as well touch upon the social status of merchants in OWN society, frequently reaching the conclusion that, while those from the lower levels of society could participate in trade, in Norway, Iceland and possibly Sweden and Denmark it was from the start dominated by comparatively rich landowners (Ebel 1987: 272; Wieske 2011: 56-59, 60, 69) – precisely the group of people we also find in the diplomataria (Section 5.2.2).

These statements are confusing at best, contradictory at worst, especially against the backdrop of written sources in the form of diplomas and sagas attesting that the king and his men as well as clerical personnel took part in trade and, in some instances, even accompanied their goods on the journey (Wieske 2011: 60, 66-69; Ebel 1987: 272, 275-277). It is possible that what Johnsen (1987: 726) *actually* means is that the crown prince, despite clear evidence that he, by extension his father King Sverrir, are partaking in trade, is not part of the group of *professional* merchants on Bryggen. However, again one encounters the problem that written sources, in particular sagas, indicate that men close to the king are undertaking extensive mercantile journeys, which in turn means that the definition of "professional" merchant is more than vague; this is not made easier by sources mentioning several types of traders/merchants (Wieske 2011: 61, 70-74). There appears to have been a distinction between men of high social status undertaking mercantile journeys for a variety of reasons versus professional merchants based on the fact that in some of the sources, merchants are mentioned specifically as a group, sometimes also as being in the service of the king (Wieske 2011: 55, 62, 67-68, 87-88). However, to my knowledge there is no study on the gradations of "merchant" in 11th-14th century Norway, much less one looking into the similarities and differences between the general developments on the continent and Norway regarding the emergence of a merchant *Stand*. The available sources indicate that social betterment was possible via trade and it appears that there

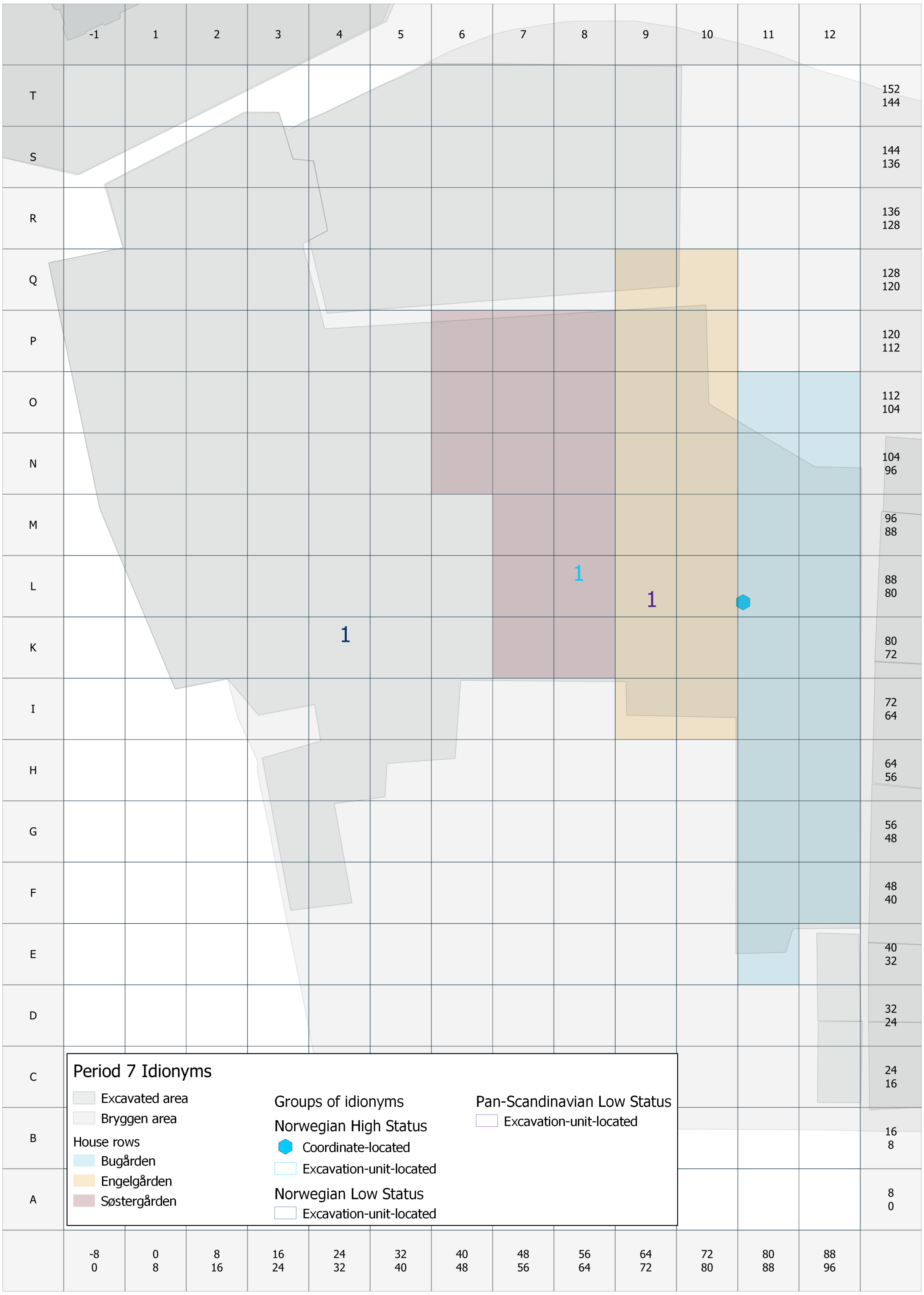


Figure 43. *Distribution of different groups of idionyms across the four house rows Bugården (blue), Engelgården (orange), Søstergården (red) and Gullskoen (remaining excavated area, grey) during period 7.*

was even a necessity to stop people from the lower social scales from participating in trade during certain times of the year, lest the fields be neglected (Wieske 2011: 55-56, 60). Still, it is not advisable to attributes the runic inscriptions to a certain social group like Johnsen (1987: 725, 736) does, who firmly ascribes the use of runes to merchants, following Liestøl (1973: 138). I am sceptical of this conclusion. The results of the onomastic analyses seem to indicate that this is the case, just like they *appear* to attest the presence of Icelanders in Bjǫrgvin, which Johnsen (1987: 733, 735-36) also seems to consider a certainty. Based on my interpretation of the data and as stated elsewhere (Section 5.7), there are only two idionyms in the material that I would with some confidence consider "Icelandic", simply based on the problematic approach of equating ethnicity with name use (Section 5.1.2).

At present, what can at most be taken away from the diploma comparison is that the Bjǫrgvin "merchants" appear to have come from very different backgrounds in terms of social status; that while trade may have been a vehicle of social mobility for some, runic inscriptions are probably not the right kind of evidence to be tracking these kinds of processes. Similarities between the name material from Bryggen and the diplomataria may not just be owed to certain idionyms being popular across the population (although that possibility should never be discounted entirely), but it may in actual fact mirror the reality that men of high social status were using Bjǫrgvin as a trade port – which would be precisely what the founder likely intended (Hansen 2008). But while there is evidence for other countries that there was an increasing number of merchants who, having acquired enough wealth, began to invest their fortune into land, something the *Konungsskuggsjá* explicitly recommends (Wieske 2011: 130-31, see also 57, 83 for an actual saga example), I am less than certain this conclusion should be applied to Norwegian/Icelandic traders by default of it happening elsewhere in Europe. Since this study could not consider the diachronic spread of idionyms, it is entirely possible that the samples also include merchants; one example coming to mind is *Áslákr,* which holds place 3 in the total ranking of Category-1b-idionyms, but does not make the ranking list in *Sverris saga* (page 117). It would be interesting to examine the documents in question with an eye to the social status of the name-bearers, especially since *Sverris saga* describes the Norwegian court under Hákon's grandfather.

Chapter 5 details in various places the dangers of assuming the absence of evidence for certain idionyms translates to evidence of absence. The Bryggen corpus is actually the perfect example to illustrate why extreme caution must be exercised when drawing such conclusions: consulting Table 60, it is blatantly obvious that the group of non-status-associated idionyms frequently makes up the largest group. Admittedly part of that is owed to the fact that several idionyms were disqualified by sorting into different quartiles in *DN* 1848-1920; *DI* 1857-1952; nevertheless there are still 47 idionyms not even mentioned in Lind (1905-1915, 1931). What should also not be forgotten is that the current status association, not to mention the conclusions regarding potential geographic origin, are based on a sample of only 242 idionyms as opposed to the at least 1,500 in Lind 1905-1915, 1931; and while 209 inscriptions were tagged for with text tags, that means 469 were not. Since the inscriptions concerning trade have traditionally garnered the most attention from scholars looking at the material, it is no surprise that the current results, based exclusively on prior scholarship, seem to point towards runes in Bjǫrgvin having potentially been used by merchants of comparatively high social status. To counterbalance this impression, I therefore also tried to include more inscriptions into the analysis.

7.6.9 Town landscape and development

For this purpose, the text tags from Chapter 6 are employed in addition to the archaeological classification and the idionyms marked as *invocations* to gather as much data and present the fullest picture possible of the purposes runes were used for in Bjǫrgvin. Since most objects are classed as "runestick", the main weight of determining an object's purpose rests on the text classification. Analysing the material from this angle is rendered more difficult by the dataset being smaller than it actually is on account of not all inscriptions having been assigned tags (Chapter 6). Therefore inscriptions

Row	Unit	Inscription	Idionyms	Object	Text tag
Søster-gården	L08	ins12	Ólafr		christian, comment, owner's tag, PN
		ins430	Óðinn, Þórr		poetry, quote
Gull-skoen	L06	ins17	María		amulet, christian, incantation, magic, prayer, quote, religious, teaching, writing exercise
	P04	ins533	Andreas/Andrés		

Table 68. *List of object classifications and text tags for objects carrying idionyms marked invocation dating to period 3, see Figure 44. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in* ***bold****.*

carrying *invocation*-marked idionyms are added as an additional set of data (Tables 68 to 71).

It is striking that the period with most archaeologically classified objects in relation to the total count of objects is period 2, where most objects are classed as owner's tag and two as tally stick (Table 61). That is particularly surprising since the *Text tag*-column reveals that a number of objects in other periods was identified as owner's tag based on their text. In some cases, the verb *á* was recognised on the object in question, but that cannot be the whole explanation for the mismatch; it would therefore be interesting to re-evaluate the definition of owner's tag from an archaeological and a runological standpoint (see the preceding section on potential scholarly bias). Comparing classifications and text tags by period while considering relative frequencies, a pattern suggesting a change in the use of runes emerges, although numbers of objects retrieved for each period or the lack of text tags for the other inscriptions may at present be skewing the picture. Still, it seems that the use of runes shifts from mostly practical purposes (owner's tags, trade-related correspondence) to more spiritual purposes. Even between periods 2 and 3, objects either carrying text thought to relate to magical purposes, or carrying invocation-idionyms become more common (Tables 61, 63 and 68). The same applies when comparing 3 to 4, where the main function and use of runes appears to be related to trade or, at the very least, ownership (Tables 63, 64, 68 and 69). While period 5 yielded most rune-inscribed objects in total, one cannot deny that there is another increase, if not in numbers of objects, then at the very least count of tokens marked as *invocations,* often on the same object (Tables 65 and 70). Period 6, however, marks the most obvious change (Tables 66 and 71). Despite a comparatively low count of objects and being one of those periods where large areas were removed by mechanical digger, it yielded six *María*-inscriptions, eight when also counting those where *María* appears with other idionyms.

Period 6 spans the decades right before and after the Plague arrived in Bjǫrgvin (1349), and for all that the material evidence is sparse and not necessarily representative, it seems that the shift in focus is mirrored in the runic inscriptions: there is a conspicuously small number of identified owner's tags dated to this period compared to the others (considering relative frequencies, not raw numbers, Table 72). Conversely, there is not even one object identified (on the basis of idionyms, text tags or object classifications) as having served anything but a mundane purpose in period 7, starting in 1413, although five objects can hardly be considered "representative" by any stretch of the imagination (Table 67). However, if they were representative of the inscriptions from the whole phase, then it would seem that things had returned to normal, with trade going on as usual.

The increase in inscriptions showing *invocation*-marked idionyms necessitates a closer look at the idionyms in question, since *invocation* is used more in opposition to *interlocutor* than as a proper identification for idionyms referring to supernatural entities in TAKERUN.

Row	Unit	Inscription	Idionyms	Object	Text tag
Søster-gården	K07	ins45	Johannes		
Gull-skoen	L06	ins419	María	foot of wooden vessel	
	N03	ins518	Samson		

Table 69. *List of object classifications and text tags for objects carrying idionyms marked invocation dating to period 4, see Figure 44. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in* ***bold****.*

Row	Unit	Inscription	Idionyms	Object	Text tag
Bugården	H11	ins204	Ólafr		
	I11	ins40	Benedikt, Margrét(a)	cross	christian, incantation, magic, not interpretable, quote
	L11	ins179	Andreas/Andrés, Johannes, Klémetr, Lafranz, María, Michael/Mikiáll, Nikulás/Nikolás, Ólafr, Pétr, Thomás		amulet, christian, incantation, magic
Engelgården	I10	ins16	Vilhelmus/Vilhiálmr		amulet, christian, incantation, magic, prayer, quote, religious, teaching, writing exercise
Gullskoen	I05	ins34	Christus, Gabriel, Jesus, María, Michael/Mikiáll, Raphael		incantation, list, magic
		ins458	Ran		poetry
	K05	ins1	Philomena, Tereus		learned, love, poetry, quote, references
		ins25	Christus		christian, liturgy, prayer
	L05	ins328	Ími		bad, incantation, magic, poetry
		ins35	Constantinus, Dionysius, Johannes, Malchus, Maximianus, Serapion		
	Q03	ins548	Ása, Grímnir, Yggjar/Yggr		love, poetry

Table 70. *List of object classifications and text tags for objects carrying idionyms marked invocation dating to period 5, see Figure 44. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in* ***bold****.*

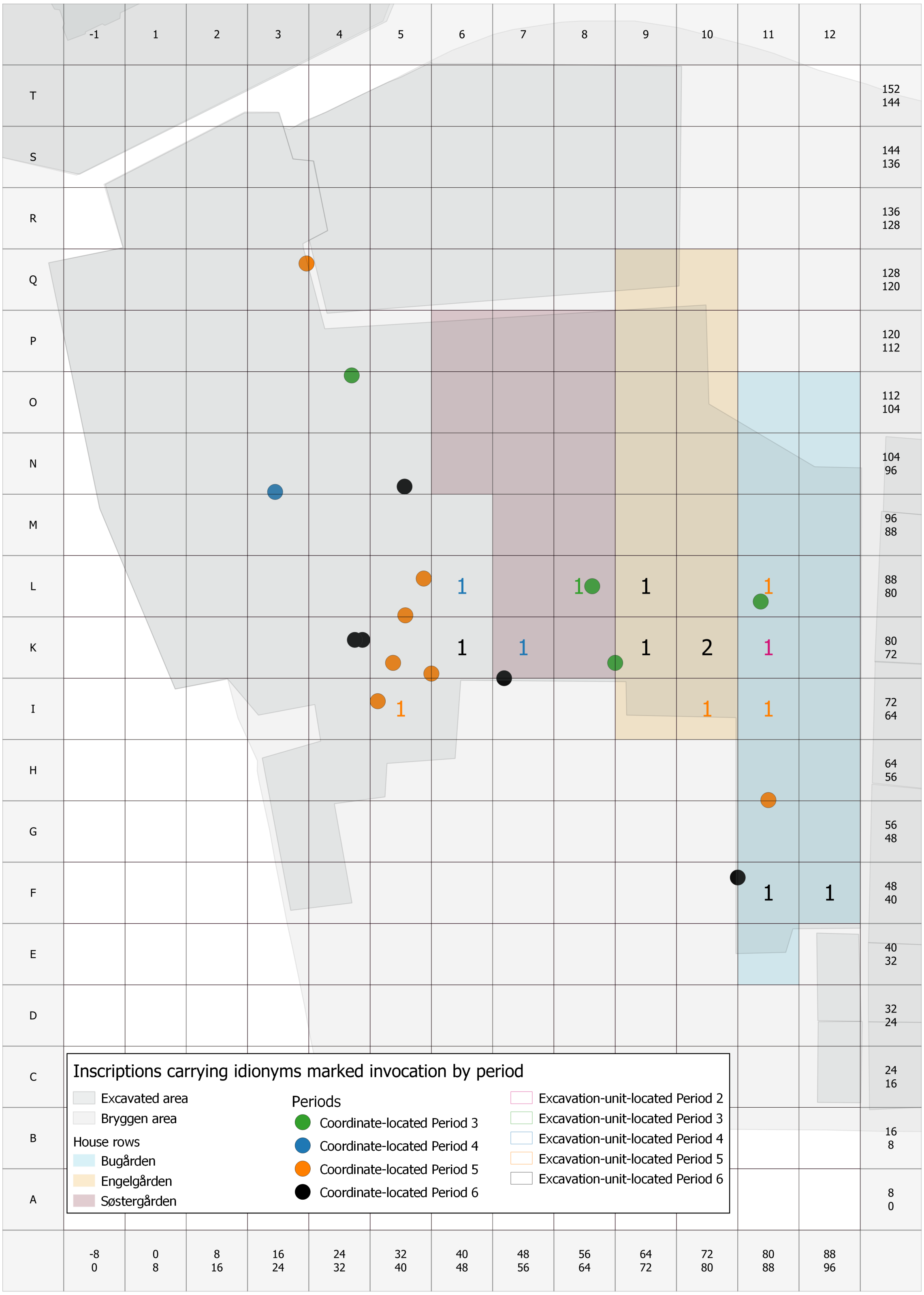


Figure 44. Location of all objects carrying invocation-idionyms or classified as prayer/incantation/christian/amulet *from periods 2 to 6, see Tables 68 to 71 for the relevant objects, Query C.73, C.74.*

Row	Unit	Inscription	Idionyms	Object	Text tag
Bugården	F11	ins20	María		christian, magic, prayer, quote, religious
		ins32	Christus, Jesus, Johannes, Lukas, María, Markús, Mat(t)heus		ambiguous, christian, incantation
	F12	ins172	María		
Engelgården	K09	ins5			amulet, incantation, regular
	K10	ins22	María		christian, magic, prayer, quote, religious
		ins29	Christus, Elisabet(h), Johannes, María		amulet, incantation, learned, magic, prayer, quote
	L09	ins19	María		amulet, christian, incantation, magic, prayer, quote, religious, teaching, writing exercise
Gullskoen	K04	ins18	María		amulet, christian, incantation, magic, prayer, quote, religious, teaching, writing exercise
		ins320	Óðinn		
	K06	ins31	Abed-Nego, Mesak, Sadrak, Tobias		christian, incantation, instruction, magic, regular
	K07	ins30	Christus		christian, incantation, magic, quote, regular
	N05	ins462	María		

Table 71. *List of object classifications and text tags for objects carrying idionyms marked invocation dating to period 6, see Figure 44. Where no object classification is provided, it is "rune-stick". Objects dated to more than one period in* ***bold.***

For idionyms marked *invocation*, periods 2 and 7 return no results (query modification WHERE phaseid LIKE "2._"/"7._" AND invocation=1, see Query C.63). The only invocation-idionym appearing consistently in periods 3 to 6 is *María,* unsurprising considering both the count of tokens (19) and the prominent position of Maria in the Christian faith. Yet period 4 only returns two more tokens in addition, amounting to only three invocations dating to the whole period, whereas 3 returns four plus one without an idionym, 5 twelve and 6 eleven in total (Table 58, page 169, Query C.65; the considerably higher number of distinct idionyms is owed to the fact that several appear in the same inscription).

	3	4	5	6
Interlocutor %	37.23	43.49	32.4	28.79
Invocation %	4.26	1.86	6.7	16.67

Table 72. *The relative frequencies of interlocutor- and invocation-marked idionyms on rune-inscribed objects by period. Raw numbers in Table 58.*

Again, even just looking at the ratios of interlocutor-to-invocation-carrying objects in Tables 58 and 72, period 6 stands out as the exception, with invocation-carrying objects making up 16.67% of the rune-inscribed objects, when during other periods, if there are any to begin with, the percentage never rises above 10. Table 72 also shows that starting from period 5, percentages drop regarding how often interlocutor-idionyms appear on rune-inscribed objects; the precise reasons for this are unknown.

Returning to the distinction between invocation-marked and invocation-used idionyms, of the five dated to period 3, two are heathen (*Óðinn, Þórr*) and used in a poetic context, so they cannot be considered proper invocations (Table 68). The other three are *Andreas/Andrés, María* and *Ólafr* and Christian(ity-associated). Whether the last should be considered an invocation given that the idionym could also be PN in this particular inscription remains open for discussion; INS17 was tagged as an amulet, although it could also have been a writing exercise according to Liestøl & Johnsen (1980-1990: 36, 41).

Period 4 yields three Christian idionyms, *Johannes, María* and *Samson* (Table 69). All are well-known characters from Christian mythology, although none of the three inscriptions was tagged, and considering that *María* appears on the foot of a wooden vessel, it could theoretically also be a sign of ownership. This is not very likely considering the apparent taboo-nature of the idionym, but still has to be taken under consideration (page 77). Surprisingly, these three invocation-idionyms comprise the whole evidence for spiritual use of runes for this period, which is both inexplicable and interesting, although there is probably a case to be made that INS278, a part of a cross, should be considered as evidence of spiritual use as well.

Period 5, in contrast, displays a broad range of references from different mythologies (Table 70): on the Christian side, *Andreas/Andrés, Benedikt, Christus, Constantinus, Dionysius, Gabriel, Jesus, Johannes, Klémetr, Lafranz, Malchus, Margrét(a), María, Maximianus, Michael/Mikiáll, Nikulás/Nikolás, Pétr, Raphael, Serapion, Thomás, Vilhelmus/Vilhiálmr* and *Ólafr* put in an appearance, a veritable collection of saints, although several of these appear in lists counting up "allir Guðs helgir menn" – all God's holy men (perhaps not quite all, but counting 9 different saints/archangels, an effort was definitely made). Greek mythology is represented by *Amor* (lacking coordinates and an associated excavation unit, this object is not listed in Table 70) and *Philomena, Tereus* in two inscriptions. These can hardly be understood in the traditional sense of "invocation", they are references to historical-mythological figures. A similar case must be made for several references to Norse mythology, like *Grímnir, Ran, Yggjar/Yggr, Ása*, two of which are alternative names for Óðinn, and were potentially used for poetic purposes. Conversely, *Ími* is tagged as "bad, incantation, magic, poetry", indicating the range of possible interpretations, which point towards this having been an actual invocation, albeit with ill-intent.

Period 6 features several references to Christian mythology, but only one to Norse: *Abed-Nego, Christus, Elisabet(h), Jesus, Johannes, Lukas, Markús, María, Mat(t)heus, Mesak, Sadrak* and *Tobias* on the one side, *Óðinn* on the other (Table 71). INS31, carrying four of the Christian idionyms, is most likely a charm meant to heal some kind of eye ailment (Liestøl & Johnsen 1980-1990: 64).

In terms of distribution across the excavation area, Figure 44 maps all inscriptions carrying at least one invocation-idionym and those tagged as *prayer/incantation/christian/amulet*. It illustrates that once more, the majority of objects is found close to the waterfront in redeposited contexts, and this is the case for all periods. Since no period but 5 has sufficient objects to talk about patterns, there is more of an overall statement to be made here, that in terms of distribution patterns, invocation-inscribed objects also appear along or close to the waterfront in redeposited contexts. Areas of spiritual activity can therefore not be identified by looking at the distribution patterns, especially since most of the inscriptions were found far away from St. Lawrence's behind Bryggen. Their distribution across the different periods, however, permits at least preliminary conclusions about changes in the use of runes as a writing medium over the course of town development, and the composition of runecarvers. The final conclusions as well as a final evaluation of the use of RDBMS for this kind of investigation are discussed in the last chapter.

8 Conclusions

The aim of this project has been twofold:

One, to determine whether more information about Bjǫrgvin's population could be gleaned by analysing the runic inscriptions as a corpus and applying a macro-perspective to the material.

Two, examining whether the tool chosen for this purpose, a relational DB, provided the required flexible data infrastructure to conduct these macro-analyses, taking into account the many different angles from which runic inscriptions can be studied.

Both topics need to be given proper space and attention, but it is the gain in knowledge about Bjǫrgvin that shall first be discussed. Due to the interdisciplinary nature of this undertaking, already interpreted inscriptions were also the focus of this project, and the aim was to see if, when considered as a corpus, more information could be wrangled from them. This was done by tentatively assigning a social status to the idionyms appearing in many of these inscriptions and using previous scholars' conclusions about the content, purpose and situational context of each inscription to get a handle on the activities these inscriptions evidence. In the last step, archaeological datings and distribution patterns were used to determine whether distribution of idionyms and evidence for different activities differed between stages of town development.

To begin with, it is important to note that only about half of the runic inscriptions dated to each period contain one or more idionyms (Table 58) and that the distribution thereof in the inscriptions can also vary greatly. Many objects only carry a single, whereas others consist of whole lists of different idionyms. Some of these lists clearly reference saints (INS35) or other mythological beings (INS1), others most likely count up actual, living people (297). Even from that sample, it becomes obvious that the reasons causing people to employ runic writing in Bjǫrgvin differ widely. However, as Section 7.6.9 illustrates, there are some indications that mapping the inscriptions across time provides glimpses at a shift in the use of runes; during the period that also sees Bjǫrgvin's population decimated by the Plague, the percentage of inscriptions mirroring spiritual activities and illness rises. It is difficult at present to say how reliable this observation is, owing to lacking tags and interpretations for the unpublished inscriptions. Granted, they may not add anything new to our knowledge, not least because several of them are probably meaningless scribbles. However, meaningful and important inscriptions like the one carved by or on order of Sigurðr Lavarðr are also amongst the officially unpublished inscriptions, so new discoveries can still be expected from the material. And even if the conclusion were that the majority of currently unpublished inscriptions are meaningless scribbles, it would still provide another group of inscriptions for comparisons, not to mention that it would hopefully add to a more balanced view of who the Bjǫrgvin rune-carvers were and which reasons they had for carving by taking the focus off the trade-related inscriptions (Section 7.6.8), which have so far been the main focus of publication and research. The proper conclusion to draw at this stage is therefore that more inscriptions need to be treated to the same kind of scrutiny and systematic registration process a RDBMS enforces.

As far as the rune-carvers are concerned, this part of the analysis rests on the extensive and therefore probably fairly reliable study of PNs by Markali (1983), further broadened by the material from Liestøl & Johnsen 1980-1990; Uppsala runforum 2014. In spatial terms, little can be said about what the distribution of interlocutor-idionym-carrying objects on the BRM 0-site might mean, since the patterns were most likely the result of waste disposal. However, the analysis shows that potentially high-status-idionyms apparently have a tendency to group when inscriptions carry more than one idionym and that non-status-associated and low-status-idionyms appear more often by themselves, although especially the latter group consists of 47 idionyms. These name lists present an interesting problem for interpretation; while there is a chance that they might indicate a *félag* or list a ship's crew (page 174), there are also arguments against interpreting them as such. In period 2, the list might indicate a mostly Norwegian and possibly high-status *félag*, but already in period 3 and period 4, the lists include feminine idionyms and different social-status-groups (pages 176 and 184), which makes a *félag* less likely, even if women could also be part of one (Johnsen 1987: 722). However, one of the difficulties here is that a *félag* according to written sources seems to have restricted the number of partners to two (Wieske 2011: 98), which number is far exceeded by the tokens/inscription. It therefore does not seem a likely interpretation, either.

In period 4, one can also observe that high-status-idionyms seem to group more than before on inscriptions with more than one idionyms (page 189), and similar observations apply to period 5, which also has the only name list made up of only feminine idionyms (page 189), and period 6, although with its greatly reduced number of objects, it is very difficult to make any conclusive statements. The reasons for this sudden accumulation of potentially high-status-idionyms are unknown. With regard to Wieske (2011), Ebel (1987) and Johnsen (1987), an argument could perhaps be made that the potentially high-status-idionym lists mirror merchants from the higher social scales, whereas the non-status-associated, single idionyms represent the lower tiers of society, who had an interest in, but could probably not take part in trade to the same extent wealthy merchants or landowners could. Without dismissing this notion out of hand, with no clear definition of what "merchant" actually means in an OWN context, should we even be attempting to look for merchants, not to mention consider them as a driving force of runic literacy in Bjǫrgvin? I am less than convinced that the various name lists are actually crew lists; I am equally doubtful that runic inscriptions are the right tools to ascertain social mobility of people. These inscriptions are more often than not restricted to one single word; hardly anything can be inferred about the person mentioned, not even necessarily that they also were the carver.

Another problem with this particular analysis is that the status assignation rests on a sample more likely to mirror Norwegian than Icelandic naming customs (Section 5.7.1), so the results are very preliminary. If further studies should confirm this observation, though, this opens up an interesting avenue of investigation; why do we see so many high-status idionyms clustering together in runic name lists? Is this confirmation that, after all, runic writing was for the most part restricted to the group of individuals with a fairly high social status? Or are the status assignations wrong and these idionyms were just widely used amongst the population? What would that in turn mean for our perception of medieval naming customs in Norway and Iceland, in particular name transfer? Although the Bryggen inscriptions carry many idionyms only occurring once, 49 appear in at least two periods, and *Sigurðr* (periods 2-6; NH) and *Gunnarr* (periods 3-7; non-status-associated, Table 78) appear in five out of six. *Sigurðr* is no surprise (page 116), and considering the quartile-placement of *Gunnarr*, its frequency is also unsurprising. Yet other idionyms from the upper quartiles do not appear frequently, which one might expect if rune-carvers were predominantly from the upper social scales. For the time being, such investigations will have to be postponed until further information and studies are available.

Another angle one could take is a comparison of the percentages in Table 60; it appears that the composition of rune-users varied between different periods. The percentages of non-status-associated idionyms mostly remain constant until 6, where the numbers drop, and 7, where the increase is sharp and steep, although that period has so few tokens little weight should be put on this observation. Comparing the relative frequencies of tokens and idionyms from the three high-status groups, NH always shows the highest percentage for tokens and objects, but surprisingly, IH surpasses it in terms of distinct idionyms in period 3 (25% to 20.45%; percentages are calculated based on total of idionyms/tokens/objects per period). IH also shows a sharp increase in tokens and idionyms from period 2 to 3, then drops slightly and remains approximately at the same level until none appear in 7. Conversely, PSH decreases steadily from 2 to 4 and only increases again in 5 and 6, with no evidence in 7. Whether these observations indicate statistically significant differences is hard to say. Running χ^2-tests is an option for the future, but I refrained from using them on this occasion because of the difficulties with the idionyms' status association; it does not seem advisable to test groups, the composition of which is based on an already prejudiced sample, against each other to then make conclusive statements. Besides, even if the differences are statistically significant, there are caveats. The observable differences may be due to preservation conditions or the duration of periods much more than to which group was actually using runes for their purposes, and the BRM 0-site in turn may not provide the best representation of who used runes in Bjǫrgvin to begin with, it being to an extent a bespoke merchant quarter. Clearly NH-tokens prevail during all periods, but NL-tokens, for example, dip below IL-tokens in period 4, 5 and 6, only recovering in 7, where there are no Icelandic tokens at all.

Based on the observation presented in Sections 7.6.2 to 7.6.7, the material also appears to mirror developments concerning the gender distribution of the rune-carvers on Bryggen, with a steady increase in feminine idionyms as time progresses. The archaeological analyses of town development have shown that Bjǫrgvin developed from a little-used space to an important trading port over the course of just two hundred years, and that the inhabitants became progressively move diverse (for example Hansen 2005a; Mygland 2023). Even accepting that we at present cannot properly define "merchant", the presence of – relatively – more feminine idionyms in the runic inscriptions (page 85) indicates that women might have played a bigger role in town development than previously assumed so far, but that their contributions are less visible on account of the gender bias of written sources. Comparisons with other trading towns and their runic inscriptions from Scandinavia might be able to shed more light on this as well.

All things considered, the results are interesting and promising, and yet the basis upon which they were calculated is, in my opinion, not reliable enough to proceed with even tentative assumptions about how the rune-carving/-using population in Bjǫrgvin may have changed in composition over the course of time. I am well aware that this is not the most desirable outcome of such a study; most scholars would prefer to be able to say something about their material at the end of such a project. At the very least, a study of runic inscriptions should present new interpretations. Yet providing new interpretations was not the aim of this project. I concerned myself with questions pertaining to the storage and technological infrastructure of already existing scholarship in a way that would enable and support future studies, then using said infrastructure to illustrate how it can be utilised for scholarly work. That the results are less-than-satisfactory is to a great deal due to the fact that important groundwork is lacking, for example statistical studies of the distribution of OWN-PNs across time and space in Iceland and Norway.

This study has still yielded an important outcome: the relational DB model developed for the purposes of analysing the Bergen corpus. MySQL, the RDBMS chosen to build TAKERUN, is not only capable of mirroring real-life circumstances, but also provides the required flexibility to allow for research into a corpus of runic inscriptions from different angles, whether the approach be onomastic, text-based or archaeological. As the main outcome of this project, the entity model developed for TAKERUN can therefore be considered a success. It works both as a stepping stone to start looking more closely at particular aspects of runic inscriptions and as a highly specified tool to collect evidence to test a hypothesis. Most importantly, this model can be easily modified to not only store the Bryggen inscriptions, but other runic inscriptions as well. The underlying structures of the core database are not modelled specifically to answer the requirements of the Bryggen inscriptions, but instead on the workflow processes of runologists, and are therefore capable of also storing other runic inscriptions. By extending the rune encoding standard from Chapter 3 to include runic rows beyond the medieval Futhark, adding non-medieval runic inscriptions is no problem. The model also allows for further additions to the research database; semantic analyses, for example, become possible by branching the data infrastructure required to do so off from PATTERNING. Even more detailed studies into the onomastic material are possible by slightly modifying IDIONYM and creating a bespoke DB model answering to the needs of onomasticians, which in turn connects to TAKERUN via IDIONYM. Both its flexibility and explicit goal of storing every prior interpretation of an inscription set this model apart from already existing DB models for runic inscriptions (Section 2.2), which were either written with specific research questions in mind (KDB, RFB) or are instead aiming to only provide the most up-to-date and generally accepted interpretations (Rundatabas, Runor). Its structure also allows connecting TAKERUN to all of the other DBs available, either via archaeological or runological identifiers; that their structures cannot be mapped onto each other one-to-one is a result of the different approaches to data/entity modelling. That however does in no way impede the possibility of linking the different DBs to each other, thus retrieving as much information as possible.

Given its flexibility and the possibilities this approach presents for runology, the model can indeed be considered the most important outcome of this project. Yet it also reinforces the statements from Chapter 2 in that the whole modelling process shows that there is no such thing as a "simple DB" when the aim is to support and further research. Digital Humanities approaches using tools like RDBMS present just one more way of doing research, and it has become clear that if the crucial steps building the tool are not undertaken with the required care, the product, whether that be a DB or an XML-based text archive like MENOTA, runs the risk of being largely unusable or unable to accommodate certain user requests. Even worse, the qualitative data analysed by these means may mistakenly be taken to represent set-in-stone facts if one is not careful enough.

Entity modelling decisions thus need to be firmly rooted in how the actual research is conducted to ensure that the resulting digital product/tool answers to expectations, and does not represent data in a misleading fashion. By default of analysing how pieces of information relate to each other, this process is very close to the humanities mindset already, where the point of research is to gain insight into human interactions with, alternatively, abstract concepts, experiences and items. It is therefore worth spending time on these considerations and potentially building test tools with small sets of data to see how they respond and if they conform to expectations, even more so when working with legacy data like the UMB DB. The process of taking apart an old dataset may in itself provide insights into how different assumptions have shaped the data and interpretation thereof.

For in the end, it is not computers who interpret data. Researchers do, and researchers, whether conscious of it or not, also model the data they use in certain fashions. It is therefore their duty to treat the digital tools they are using with the same caution as they treat theories, and be clear on how these influence their research output.

It is my hope that this study has thoroughly illustrated the step-by-step process of building a relational DB solidly based on the work of runologists and that the outcomes have demonstrated how efficient a digital tool like a bespoke relational DB can be when analysing runic corpora from a macro-perspective. It is equally my hope that the model presented here can serve as a blueprint for further research and projects, especially where traditional publication of whole corpora of archaeological, onomastic or textual materials is impossible and alternative methods have to be considered.

Appendices

A Inventory numbers

Table 73. *Complete list of inventory numbers. "Museum" is the official complete inventory number assigned to each object by Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" the siglum assigned to each inscription in NIYR VI, "Bergen" indicates the numbers assigned by Liestøl during his first examination and* Rundatabas *the identifier used by Samnordisk runtextdatabas. "Runor" provides a link to the web application of Samnordisk runtextdatabas, where transliterations and normalisations can be found.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS1	0000/031265/001	603	330	N 603 M	N 603
INS2	0000/084381/001	606	563	N 606 M	N 606
INS3	0000/010568/001	607	36	N 607 M	N 607
INS4	0000/030315/001	604	296	N 604 M	N 604
INS5	0000/015203/001	608	84	N 608 M	N 608
INS6	0000/013033/001	605	71	N 605 M	N 605
INS7	0000/041163/001	609	440	N 609 M	N 609
INS8	0000/012886/001	610	69	N 610 M	N 610
INS9	0000/029305/001	611	270	N 611 M	N 611
INS10	0000/029751/001	612	285	N 612 M	N 612
INS11	0000/019326/001	613	159	N 613 M	N 613
INS12	0000/035508/001	614	389	N 614 M	N 614
INS13	0000/033747/001	615	375	N 615 M	N 615
INS14	0000/011214/001	616	42	N 616 M	N 616
INS15	0000/068064/001	617	543	N 617 M	N 617
INS16	0000/018094/001	618	130	N 618 M	N 618
INS17	0000/032891/001	619	370	N 619 M	N 619
INS18	0000/026041/001	620	233	N 620 M	N 620
INS19	0000/015301/001	621	85	N 621 M	N 621
INS20	0000/009242/001	622	7	N 622 M	N 622
INS21	0000/023851/001	623	577	N 623 M	N 623
INS22	0000/013796/001	624	75	N 624 M	N 624
INS23	0000/012883/001	625	33	N 625 M	N 625
INS24	0000/001244/001	626	573	N 626 M	N 626
INS25	0000/030711/001	627	310	N 627 M	N 627
INS26	0000/043754/001	628	471	N 628 M	N 628
INS27	0000/031525/001	629	341	N 629 M	N 629
INS28	0000/009241/001	630	5	N 630 M	N 630
INS29	0000/013894/001	631	73	N 631 M	N 631
INS30	0000/027316/001	632	248	N 632 M	N 632
INS31	0000/028202/001	633	251	N 633 M	N 633
INS32	0000/016904/001	634	106	N 634 M	N 634
INS33	0000/068384/001	635	544	N 635 M	N 635
INS34	0000/037293/001	636	407	N 636 M	N 636
INS35	0000/031413/001	637	337	N 637 M	N 637
INS36	0000/065550/001	638	541	N 638 M	N 638

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS37	0000/061702/001	639	528	N 639 M	N 639
INS38	0000/036584/001	640	394	N 640 M	N 640
INS39	0000/023504/001	641	207	N 641 M	N 641
INS40	0000/007529/001	642	6	N 642 M	N 642
INS41	0000/022368/001	643	201	N 643 M	N 643
INS42	0000/012090/001	644	50	N 644 M	N 644
INS43	0000/041612/001	645	444	N 645 M	N 645
INS44	0000/028771/001	646	258	N 646 M	N 646
INS45	0000/029706/001	647	284	N 647 M	N 647
INS46	0000/021919/001	648	195	N 648 M	N 648
INS47	0000/026374/001	649	238	N 649 M	N 649
INS48	0000/040325/001	650	432	N 650 M	N 650
INS49	0000/029622/001	651	279	N 651 M	N 651
INS50	0000/037789/001	652	418	N 652 M	N 652
INS51	0000/037564/001	653	412	N 653 M	N 653
INS52	0000/088800/001	654	602	N 654 M	N 654
INS53	0000/016154/001	655	95	N 655 M	N 655
INS54	0000/031181/001	656	324	N 656 M	N 656
INS55	0000/017399/001	657	114	N 657 M	N 657
INS56	0000/041038/001	658	438	N 658 M	N 658
INS57	0000/033737/001	659	372	N 659 M	N 659
INS58	0000/029418/001	660	272	N 660 M	N 660
INS59	0000/027205/001	661	247	N 661 M	N 661
INS60	0000/012588/001	662	63	N 662 M	N 662
INS61	0000/012401/001	663	61	N 663 M	N 663
INS62	0000/032056/001	664	356	N 664 M	N 664
INS63	0000/021967/001	665	196	N 665 M	N 665
INS64	0000/055524/001	666	514	N 666 M	N 666
INS65	0000/043756/001	667	473	N 667 M	N 667
INS66	0000/044013/001	668	477	N 668 M	N 668
INS67	0000/012923/001	669	70	N 669 M	N 669
INS68	0000/019052/001	670	152	N 670 M	N 670
INS69	0000/043109/001	671	464	N 671 M	N 671
INS70	0000/020438/001	672	173	N 672 M	N 672
INS71	0000/019517/001	673	162	N 673 M	N 673
INS72	0000/019809/001	674	169	N 674 M	N 674
INS73	0000/079607/001	675	555	N 675 M	N 675
INS74	0000/010567/001	676	37	N 676 M	N 676
INS75	0000/031902/001	677	350	N 677 M	N 677
INS76	0000/084690/001	678	564	N 678 M	N 678
INS77	0000/018095/001	679	131	N 679 M	N 679
INS78	0000/019180/001	680	157	N 680 M	N 680

Table 73. Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl, Rundatabas = *Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS79	0000/018333/001	681	139	N 681 M	N 681
INS80	0000/044817/001	682	482	N 682 M	N 682
INS81	0000/031036/001	683	318	N 683 M	N 683
INS82	0000/060622/001	684	523	N 684 M	N 684
INS83	0000/063657/001	685	538	N 685 M	N 685
INS84	0000/031172/001	686	322	N 686 M	N 686
INS85	0000/085675/001	687	567	N 687 M	N 687
INS86	0000/012187/001	688	52	N 688 M	N 688
INS87	0000/025282/001	689	220	N 689 M	N 689
INS88	0000/043755/001	690	472	N 690 M	N 690
INS89	0000/031803/001	691	345	N 691 M	N 691
INS90	0000/040969/001	692	437	N 692 M	N 692
INS91	0000/031901/001	693	349	N 693 M	N 693
INS91	0000/031901/001	694	349	N 694 M	N 694
INS92	0000/020780/001	695	179	N 695 M	N 695
INS93	0000/031443/001	696	339	N 696 M	N 696
INS94	0000/020653/001	697	175	N 697 M	N 697
INS95	0000/021996/001	698	197	N 698 M	N 698
INS96	0000/035462/001	699	388	N 699 M	N 699
INS97	0000/021515/001	700	194	N 700 M	N 700
INS98	0000/036385/001	701	393	N 701 M	N 701
INS99	0000/024158/001	702	213	N 702 M	N 702
INS100	0000/034459/001	703	376	N 703 M	N 703
INS101	0000/025336/001	704	222	N 704 M	N 704
INS102	0000/041940/001	705	446	N 705 M	N 705
INS103	0000/043439/001	706	468	N 706 M	N 706
INS104	0000/040456/001	707	433	N 707 M	N 707
INS105	0000/009181/001	708	23	N 708 M	N 708
INS106	0000/017526/001	709	117	N 709 M	N 709
INS107	0000/011762/001	710	47	N 710 M	N 710
INS108	0000/036994/001	711	397	N 711 M	N 711
INS109	0000/020668/001	712	176	N 712 M	N 712
INS110	0000/020882/001	713	182	N 713 M	N 713
INS111	0000/009113/001	714	21	N 714 M	N 714
INS112	0000/023007/001	715	204	N 715 M	N 715
INS113	0000/028729/001	716	256	N 716 M	N 716
INS114	0000/019117/001	717	155	N 717 M	N 717
INS115	0000/031994/001	718	353	N 718 M	N 718
INS116	0000/019531/001	719	164	N 719 M	N 719
INS117	0000/014840/001	720	80	N 720 M	N 720
INS118	0000/012692/001	721	67	N 721 M	N 721
INS119	0000/030412/001	722	297	N 722 M	N 722

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas = *Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS120	0000/031771/001	723	344	N 723 M	N 723
INS121	0000/018710/001	724	148	N 724 M	N 724
INS122	0000/019041/001	725	151	N 725 M	N 725
INS123	0000/029690/001	726	283	N 726 M	N 726
INS124	0000/030580/001	727	302	N 727 M	N 727
INS125	0076/006196/001	728	595	N 728 M	N 728
INS126	0000/061658/001	729	527	N 729 M	N 729
INS127	0000/023971/001	730	209	N 730 M	N 730
INS128	0000/063648/001	731	537	N 731 M	N 731
INS129	0000/040108/001	732	428	N 732 M	N 732
INS130	0000/017680/001	733	121	N 733 M	N 733
INS131	0000/031171/001	734	321	N 734 M	N 734
INS132	0000/030690/001	735	309	N 735 M	N 735
INS133	0000/030941/001	736	316	N 736 M	N 736
INS134	0000/052994/001	737	506	N 737 M	N 737
INS135	0000/044562/001	738	481	N 738 M	N 738
INS136	0000/019278/001	739	210	N 739 M	N 739
INS137	0000/031187/001	740	326	N 740 M	N 740
INS138	0000/029281/001	741	269	N 741 M	N 741
INS139	0000/019116/001	742	154	N 742 M	N 742
INS140	0000/077156/001	743	553	N 743 M	N 743
INS141	0000/044372/001	744	478	N 744 M	N 744
INS142	0000/019718/001	745	167	N 745 M	N 745
INS143	0000/028821/001	746	261	N 746 M	N 746
INS144	0000/032077/001	747	360	N 747 M	N 747
INS145	0000/037807/001	748	419	N 748 M	N 748
INS146	0000/054388/001	749	513	N 749 M	N 749
INS147	0000/018628/001	750	146	N 750 M	N 750
INS148	0000/032060/001	751	357	N 751 M	N 751
INS149	0000/031444/001	752	340	N 752 M	N 752
INS150	0000/016903/001	753	105	N 753 M	N 753
INS151	0000/024349/001	754	216	N 754 M	N 754
INS152	0000/034460/001	755	377	N 755 M	N 755
INS153	0000/022079/001	756	198	N 756 M	N 756
INS154	0000/037382/001	757	408	N 757 M	N 757
INS155	0000/013093/001	758	72	N 758 M	N 758
INS156	0000/042518/001	759	456	N 759 M	N 759
INS157	0000/011478/001	760	43	N 760 M	N 760
INS158	0000/016411/001	761	98	N 761 M	N 761
INS159	0000/022296/001	762	199	N 762 M	N 762
INS160	0000/032075/001	763	358	N 763 M	N 763
INS161	0000/061923/001	764	531	N 764 M	N 764

Table 73. Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl, Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS162	0000/060383/001	765	522	N 765 M	N 765
INS163	0000/008953/001	766	16	N 766 M	N 766
INS164	0000/040669/001	767	435	N 767 M	N 767
INS165	0000/040277/001	768	430	N 768 M	N 768
INS166	0000/022736/001	769	202	N 769 M	N 769
INS167	0000/033746/001	770	374	N 770 M	N 770
INS168	0000/045966/001	771	487	N 771 M	N 771
INS169	0000/026328/001	772	236	N 772 M	N 772
INS170	0000/008950/001	773	14	N 773 M	N 773
INS171	0048/000000/001		1	N B1 M	N B1
INS172	0000/001102/001		3	N B3 M	N B3
INS173	0000/003028/001		4	N B4 M	N B4
INS174	0000/004450/001		8	N B8 M	N B8
INS175	0000/008445/001		9	N B9 M	N B9
INS176	0000/006522/001		10	N B10 M	N B10
INS177	0000/008561/001		11	N B11 M	N B11
INS178	0000/008602/001		12	N B12 M	N B12
INS179	0000/008760/001		13	N B13 M	N B13
INS180	0000/008951/001		15	N B15 M	N B15
INS181	0000/009059/001		17	N B17 M	N B17
INS182	0000/009060/001		18	N B18 M	N B18
INS183	0000/009060/002		19	N B19 M	N B19
INS184	0000/009098/001		20	N B20 M	N B20
INS185	0000/009180/001		22	N B22 M	N B22
INS186	0000/009291/001		24	N B24 M	N B24
INS187	0000/009610/001		25	N B25 M	N B25
INS188	0000/010006/001		26	N B26 M	N B26
INS189	0000/010398/001		27	N B27 M	N B27
INS190	0000/011855/001		28	N B28 M	N B28
INS191	0000/011889/001		29	N B29 M	N B29
INS192	0000/012318/001		30	N B30 M	N B30
INS193	0000/012838/001		32	N B32 M	N B32
INS194	0000/003520/001		34	N B34 M	N B34
INS195	0000/010554/001		35	N B35 M	N B35
INS196	0000/010668/001		38	N B38 M	N B38
INS197	0000/010667/001		39	N B39 M	N B39
INS198	0000/010664/001		40	N B40 M	N B40
INS199	0000/010552/001		41	N B41 M	N B41
INS200	0000/011476/001		44	N B44 M	N B44
INS201	0000/011477/001		45	N B45 M	N B45
INS202	0000/011479/001		46	N B46 M	N B46
INS203	0000/011835/001		48	N B48 M	N B48

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS204	0000/011952/001		49	N B49 M	N B49
INS205	0000/012186/001		51	N B51 M	N B51
INS206	0000/012275/001		53	N B53 M	N B53
INS207	0000/012274/001		55	N B55 M	N B55
INS208	0000/012319/001		56	N B56 M	N B56
INS209	0000/012486/001		57	N B57 M	N B57
INS210	0000/012033/001		58	N B58 M	N B58
INS211	0000/012502/001		59	N B59 M	N B59
INS212	0000/012334/001		60	N B60 M	N B60
INS213	0000/012498/001		62	N B62 M	N B62
INS214	0000/012591/001		64	N B64 M	N B64
INS215	0000/012691/001		65	N B65 M	N B65
INS216	0000/012777/001		66	N B66 M	N B66
INS217	0000/012865/001		68	N B68 M	N B68
INS218	0000/013775/001		74	N B74 M	N B74
INS219	0000/013946/001		76	N B76 M	N B76
INS220	0000/014308/001		77	N B77 M	N B77
INS221	0000/014307/001		78	N B78 M	N B78
INS222	0000/014169/001		79	N B79 M	N B79
INS223	0000/014642/001		81	N B81 M	N B81
INS224	0000/015049/001		82	N B82 M	N B82
INS225	0000/015284/001		86	N B86 M	N B86
INS226	0000/015660/001		87	N B87 M	N B87
INS227	0000/015845/001		88	N B88 M	N B88
INS228	0000/015955/001		89	N B89 M	N B89
INS229	0000/015912/001		90	N B90 M	N B90
INS230	0000/016058/001		91	N B91 M	N B91
INS231	0000/016059/001		92	N B92 M	N B92
INS232	0000/016037/001		93	N B93 M	N B93
INS233	0000/016181/001		94	N B94 M	N B94
INS234	0000/016413/001		99	N B99 M	N B99
INS235	0000/016413/002		100	N B100 M	N B100
INS236	0000/016645/001		101	N B101 M	N B101
INS237	0000/016706/001		102	N B102 M	N B102
INS238	0000/016777/001		103	N B103 M	N B103
INS239	0000/016858/001		104	N B104 M	N B104
INS240	0000/016911/001		107	N B107 M	N B107
INS241	0000/006945/001		108	N B108 M	N B108
INS242	0000/016982/001		109	N B109 M	N B109
INS243	0000/006989/001		110	N B110 M	N B110
INS244	0000/017060/001		111	N B111 M	N B111
INS245	0000/017223/001		112	N B112 M	N B112

Table 73. Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl, Rundadatabas = *Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS246	0000/017252/001		113	N B113 M	N B113
INS247	0000/017427/001		115	N B115 M	N B115
INS248	0000/017428/001		116	N B116 M	N B116
INS249	0000/017540/001		118	N B118 M	N B118
INS250	0000/017595/001		119	N B119 M	N B119
INS251	0000/017701/001		122	N B122 M	N B122
INS252	0000/017702/001		123	N B123 M	N B123
INS253	0000/017704/001		124	N B124 M	N B124
INS254	0000/018010/001		126	N B126 M	N B126
INS255	0000/018211/001		127	N B127 M	N B127
INS256	0000/018052/001		128	N B128 M	N B128
INS257	0000/018093/001		129	N B129 M	N B129
INS258	0000/018110/001		132	N B132 M	N B132
INS259	0000/017379/001		133	N B133 M	N B133
INS260	0000/018173/001		134	N B134 M	N B134
INS261	0000/018253/001		135	N B135 M	N B135
INS262	0000/018254/001		136	N B136 M	N B136
INS263	0000/018271/001		138	N B138 M	N B138
INS264	0000/018441/001		140	N B140 M	N B140
INS265	0000/018540/001		142	N B142 M	N B142
INS266	0000/018595/001		143	N B143 M	N B143
INS267	0000/018910/001		145	N B145 M	N B145
INS268	0000/018679/001		147	N B147 M	N B147
INS269	0000/018959/001		149	N B149 M	N B149
INS270	0000/018990/001		150	N B150 M	N B150
INS271	0000/019090/001		153	N B153 M	N B153
INS272	0000/019161/001		156	N B156 M	N B156
INS273	0000/019181/001		158	N B158 M	N B158
INS274	0000/019385/001		160	N B160 M	N B160
INS275	0000/019386/001		161	N B161 M	N B161
INS276	0000/019529/001		163	N B163 M	N B163
INS277	0000/019563/001		165	N B165 M	N B165
INS278	0000/019734/001		168	N B168 M	N B168
INS279	0000/020001/001		170	N B170 M	N B170
INS280	0000/020015/001		171	N B171 M	N B171
INS281	0000/020315/001		172	N B172 M	N B172
INS282	0000/020482/001		174	N B174 M	N B174
INS283	0000/020669/001		177	N B177 M	N B177
INS284	0000/020695/001		178	N B178 M	N B178
INS285	0000/020834/001		180	N B180 M	N B180
INS286	0000/020881/001		181	N B181 M	N B181
INS287	0000/020893/001		183	N B183 M	N B183

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS288	0000/020969/001		184	N B184 M	N B184
INS289	0000/021265/001		185	N B185 M	N B185
INS290	0000/021364/001		187	N B187 M	N B187
INS291	0000/021365/001		188	N B188 M	N B188
INS292	0000/021424/001		189	N B189 M	N B189
INS293	0000/021425/001		190	N B190 M	N B190
INS294	0000/021430/001		191	N B191 M	N B191
INS295	0000/021432/001		192	N B192 M	N B192
INS296	0000/021514/001		193	N B193 M	N B193
INS297	0000/022322/001		200	N B200 M	N B200
INS298	0000/023006/001		203	N B203 M	N B203
INS299	0000/023493/001		205	N B205 M	N B205
INS300	0000/023503/001		206	N B206 M	N B206
INS301	0000/022600/001		208	N B208 M	N B208
INS302	0000/020885/001		211	N B211 M	N B211
INS303	0000/024255/001		214	N B214 M	N B214
INS304	0000/024348/001		215	N B215 M	N B215
INS305	0000/024410/001		217	N B217 M	N B217
INS306	0000/024793/001		218	N B218 M	N B218
INS307	0000/024842/001		219	N B219 M	N B219
INS308	0000/025329/001		221	N B221 M	N B221
INS309	0000/025410/001		223	N B223 M	N B223
INS310	0000/025461/001		225	N B225 M	N B225
INS311	0000/025476/001		226	N B226 M	N B226
INS312	0000/025535/001		227	N B227 M	N B227
INS313	0000/025604/001		228	N B228 M	N B228
INS314	0000/025670/001		229	N B229 M	N B229
INS315	0000/025671/001		230	N B230 M	N B230
INS316	0000/026268/001		235	N B235 $M	N B235
INS317	0000/026349/001		237	N B237 M	N B237
INS318	0000/026384/001		239	N B239 M	N B239
INS319	0000/026415/001		240	N B240 M	N B240
INS320	0000/026421/001		241	N B241 M	N B241
INS321	0000/026652/001		242	N B242 M	N B242
INS322	0000/026900/001		243	N B243 M	N B243
INS323	0000/026955/001		244	N B244 M	N B244
INS324	0000/027173/001		245	N B245 M	N B245
INS325	0000/027206/001		246	N B246 M	N B246
INS326	0000/027487/001		249	N B249 M	N B249
INS327	0000/028197/001		250	N B250 M	N B250
INS328	0000/028465/001		252	N B252 M	N B252
INS329	0000/028524/001		253	N B253 M	N B253

Table 73. Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl, Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS330	0000/028541/001		254	N B254 M	N B254
INS331	0000/028553/001		255	N B255 M	N B255
INS332	0000/028770/001		257	N B257 M	N B257
INS333	0000/028796/001		259	N B259 M	N B259
INS334	0000/028800/001		260	N B260 M	N B260
INS335	0000/028975/001		262	N B262 M	N B262
INS336	0000/029106/001		263	N B263 M	N B263
INS337	0000/029162/001		264	N B264 M	N B264
INS338	0000/029180/001		265	N B265 M	N B265
INS339	0000/029217/001		266	N B266 M	N B266
INS340	0000/029258/001		267	N B267 M	N B267
INS341	0000/029259/001		268	N B268 M	N B268
INS342	0000/029306/001		271	N B271 M	N B271
INS343	0000/029460/001		273	N B273 M	N B273
INS344	0000/029461/001		274	N B274 M	N B274
INS345	0076/006194/001		593	N B593 M	N B593
INS346	0076/006195/001		594	N B594 M	N B594
INS347	0076/007660/001		596	N B596 M	N B596
INS348	0076/008805/001		597	N B597 M	N B597
INS349	0000/087771/001		598	N B598 M	N B598
INS350	0000/087909/001		599	N B599 M	N B599
INS351	0000/088536/001		600	N B600 M	N B600
INS352	0000/088788/001		601	N B601 M	N B601
INS353	0000/095055/001		603	N B603 M	N B603
INS354	0000/095056/001		604	N B604 M	N B604
INS355	0000/052927/001		605	N B605 M	N B605
INS356	0000/078137/001		606	N B606 M	N B606
INS357	0094/001248/001		607	N B607 M	N B607
INS358	0076/009221/001		608	N B608 M	N B608
INS359	0076/006651/001		609	N B609 M	N B609
INS360	0076/006898/001		610	N B610 M	N B610
INS361	0076/006197/001		611	N B611 M	N B611
INS362	0000/006815/001		612	N B612 M	N B612
INS363	0076/011744/001		613	N B613 M	N B613
INS364	0076/006200/001		614	N B614 M	N B614
INS365	0000/029466/001		275	N B275 M	N B275
INS366	0000/029526/001		276	N B276 M	N B276
INS367	0000/029585/001		277	N B277 M	N B277
INS368	0000/029637/001		280	N B280 M	N B280
INS369	0000/029669/001		281	N B281 M	N B281
INS370	0000/029676/001		282	N B282 M	N B282
INS371	0000/029804/001		286	N B286 M	N B286

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS372	0000/029888/001		287	N B287 M	N B287
INS373	0000/029909/001		288	N B288 M	N B288
INS374	0000/029958/001		289	N B289 M	N B289
INS375	0000/029977/001		290	N B290 M	N B290
INS376	0000/029991/001		291	N B291 M	N B291
INS377	0000/030053/001		292	N B292 M	N B292
INS378	0000/030085/001		293	N B293 M	N B293
INS379	0000/030096/001		294	N B294 M	N B294
INS380	0000/030198/001		295	N B295 M	N B295
INS381	0000/030427/001		298	N B298 M	N B298
INS382	0000/030429/001		300	N B300 M	N B300
INS383	0000/030551/001		301	N B301 M	N B301
INS384	0000/030581/001		303	N B303 M	N B303
INS385	0000/030631/001		304	N B304 M	N B304
INS386	0000/030649/001		305	N B305 M	N B305
INS387	0000/030666/001		306	N B306 M	N B306
INS388	0000/030689/001		307	N B307 M	N B307
INS389	0000/030760/001		308	N B308 M	N B308
INS390	0000/030746/001		311	N B311 M	N B311
INS391	0000/030759/001		313	N B313 M	N B313
INS392	0000/030812/001		314	N B314 M	N B314
INS393	0000/030913/001		315	N B315 M	N B315
INS394	0000/030948/001		317	N B317 M	N B317
INS395	0000/031085/001		319	N B319 M	N B319
INS396	0000/031170/001		320	N B320 M	N B320
INS397	0000/031173/001		323	N B323 M	N B323
INS398	0000/031182/001		325	N B325 M	N B325
INS399	0000/031188/001		327	N B327 M	N B327
INS400	0000/031228/001		328	N B328 M	N B328
INS401	0000/031229/001		329	N B329 M	N B329
INS402	0000/031354/001		331	N B331 M	N B331
INS403	0000/031355/001		332	N B332 M	N B332
INS404	0000/031390/001		333	N B333 M	N B333
INS405	0000/031410/001		334	N B334 M	N B334
INS406	0000/031411/001		335	N B335 M	N B335
INS407	0000/031412/001		336	N B336 M	N B336
INS408	0000/031414/001		338	N B338 M	N B338
INS409	0000/031623/001		342	N B342 M	N B342
INS410	0000/031710/001		343	N B343 M	N B343
INS411	0000/031804/001		346	N B346 M	N B346
INS412	0000/031868/001		347	N B347 M	N B347
INS413	0000/031900/001		348	N B348 M	N B348

Table 73. Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl, Rundatabas = *Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS414	0000/031903/001		351	N B351 M	N B351
INS415	0000/031904/001		352	N B352 M	N B352
INS416	0000/032033/001		354	N B354 M	N B354
INS417	0000/032034/001		355	N B355 M	N B355
INS418	0000/032120/001		361	N B361 M	N B361
INS419	0000/032303/001		362	N B362 M	N B362
INS420	0000/032746/001		364	N B364 M	N B364
INS421	0000/032747/001		365	N B365 M	N B365
INS422	0000/032853/001		366	N B366 M	N B366
INS423	0000/032854/001		367	N B367 M	N B367
INS424	0000/032875/001		368	N B368 M	N B368
INS425	0000/032890/001		369	N B369 M	N B369
INS426	0000/032923/001		371	N B371 M	N B371
INS427	0000/033738/001		373	N B373 M	N B373
INS428	0000/034551/001		378	N B378 M	N B378
INS429	0000/034556/001		379	N B379 M	N B379
INS430	0000/034880/001		380	N B380 M	N B380
INS431	0000/035038/001		381	N B381 M	N B381
INS432	0000/035066/001		382	N B382 M	N B382
INS433	0000/035067/001		383	N B383 M	N B383
INS434	0000/035229/001		384	N B384 M	N B384
INS435	0000/035283/001		385	N B385 M	N B385
INS436	0000/035363/001		386	N B386 M	N B386
INS437	0000/035460/001		387	N B387 M	N B387
INS438	0000/035509/001		390	N B390 M	N B390
INS439	0000/035944/001		391	N B391 M	N B391
INS440	0000/036360/001		392	N B392 M	N B392
INS441	0000/036917/001		395	N B395 M	N B395
INS442	0000/036929/001		396	N B396 M	N B396
INS443	0000/036995/001		398	N B398 M	N B398
INS444	0000/037017/001		399	N B399 M	N B399
INS445	0000/037046/001		400	N B400 M	N B400
INS446	0000/037092/001		401	N B401 M	N B401
INS447	0000/037196/001		402	N B402 M	N B402
INS448	0000/037208/001		403	N B403 M	N B403
INS449	0000/037261/001		404	N B404 $M	N B404
INS450	0000/037277/001		405	N B405 M	N B405
INS451	0000/037283/001		406	N B406 M	N B406
INS452	0000/037383/001		409	N B409 M	N B409
INS453	0000/037384/001		410	N B410 M	N B410
INS454	0000/037385/001		411	N B411 M	N B411
INS455	0000/037565/001		413	N B413 M	N B413

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS456	0000/037596/001		414	N B414 M	N B414
INS457	0000/037648/001		415	N B415 M	N B415
INS458	0000/037672/001		416	N B416 M	N B416
INS459	0000/037732/001		417	N B417 M	N B417
INS460	0000/037844/001		420	N B420 M	N B420
INS461	0000/037885/001		421	N B421 M	N B421
INS462	0000/037957/001		422	N B422 M	N B422
INS463	0000/038244/001		423	N B423 M	N B423
INS464	0000/039522/001		424	N B424 M	N B424
INS465	0000/039917/001		425	N B425 M	N B425
INS466	0000/039977/001		426	N B426 M	N B426
INS467	0000/040000/001		427	N B427 M	N B427
INS468	0000/040127/001		429	N B429 M	N B429
INS469	0000/040324/001		431	N B431 M	N B431
INS470	0000/040576/001		434	N B434 M	N B434
INS471	0000/040763/001		436	N B436 M	N B436
INS472	0000/041056/001		439	N B439 M	N B439
INS473	0000/041170/001		441	N B441 M	N B441
INS474	0000/041353/001		442	N B442 M	N B442
INS475	0000/041393/001		443	N B443 M	N B443
INS476	0000/041939/001		445	N B445 M	N B445
INS477	0000/042000/001		447	N B447 M	N B447
INS478	0000/042011/001		448	N B448 M	N B448
INS479	0000/042050/001		449	N B449 M	N B449
INS480	0000/042090/001		450	N B450 M	N B450
INS481	0000/042269/001		451	N B451 M	N B451
INS482	0000/042270/001		452	N B452 M	N B452
INS483	0000/042375/001		453	N B453 M	N B453
INS484	0000/042433/001		454	N B454 M	N B454
INS485	0000/042491/001		455	N B455 M	N B455
INS486	0000/042536/001		457	N B457 M	N B457
INS487	0000/042606/001		458	N B458 M	N B458
INS488	0000/042653/001		459	N B459 M	N B459
INS489	0000/042707/001		460	N B460 M	N B460
INS490	0000/042807/001		461	N B461 M	N B461
INS491	0000/043025/001		462	N B462 M	N B462
INS492	0000/043072/001		463	N B463 M	N B463
INS493	0000/043110/001		465	N B465 M	N B465
INS494	0000/043163/001		466	N B466 M	N B466
INS495	0000/043256/001		467	N B467 M	N B467
INS496	0000/043661/001		469	N B469 M	N B469
INS497	0000/043704/001		470	N B470 M	N B470

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS498	0000/043757/001		474	N B474 M	N B474
INS499	0000/043903/001		475	N B475 M	N B475
INS500	0000/043965/001		476	N B476 M	N B476
INS502	0000/044410/001		479	N B479 M	N B479
INS503	0000/044477/001		480	N B480 M	N B480
INS504	0000/044851/001		483	N B483 M	N B483
INS505	0000/045930/001		485	N B485 M	N B485
INS506	0000/046336/001		488	N B488 M	N B488
INS507	0000/046571/001		489	N B489 M	N B489
INS508	0000/046440/001		490	N B490 M	N B490
INS509	0000/046717/001		491	N B491 M	N B491
INS510	0000/050605/001		492	N B492 M	N B492
INS511	0000/051140/001		493	N B493 M	N B493
INS512	0000/051203/001		494	N B494 M	N B494
INS513	0000/051219/001		495	N B495 M	N B495
INS514	0000/051385/001		496	N B496 M	N B496
INS515	0000/052098/001		497	N B497 M	N B497
INS516	0000/052299/001		499	N B499 M	N B499
INS517	0000/052402/001		500	N B500 M	N B500
INS518	0000/052511/001		501	N B501 M	N B501
INS519	0000/052560/001		502	N B502 M	N B502
INS520	0000/052722/001		503	N B503 M	N B503
INS521	0000/052790/001		504	N B504 M	N B504
INS522	0000/052920/001		505	N B505 M	N B505
INS523	0000/053257/001		508	N B508 M	N B508
INS524	0000/053472/001		509	N B509 M	N B509
INS525	0000/053473/001		510	N B510 M	N B510
INS526	0000/053705/001		511	N B511 M	N B511
INS527	0000/054086/001		512	N B512 M	N B512
INS528	0000/055618/001		515	N B515 M	N B515
INS529	0000/057281/001		516	N B516 M	N B516
INS530	0000/058642/001		518	N B518 M	N B518
INS531	0000/059523/001		520	N B520 M	N B520
INS532	0000/060182/001		521	N B521 M	N B521
INS533	0000/061088/001		524	N B524 M	N B524
INS534	0000/061300/001		525	N B525 M	N B525
INS535	0000/061423/001		526	N B526 M	N B526
INS536	0000/061802/001		529	N B529 M	N B529
INS537	0000/061817/001		530	N B530 M	N B530
INS538	0000/062071/001		532	N B532 M	N B532
INS539	0000/062382/001		533	N B533 M	N B533
INS540	0000/063013/001		534	N B534 M	N B534

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS541	0000/063019/001		535	N B535 M	N B535
INS542	0000/063186/001		536	N B536 M	N B536
INS543	0000/064049/001		539	N B539 M	N B539
INS544	0000/064079/001		540	N B540 M	N B540
INS545	0000/065770/001		542	N B542 M	N B542
INS546	0000/070535/001		546	N B546 M	N B546
INS547	0000/071477/001		547	N B547 M	N B547
INS548	0000/071491/001		548	N B548 M	N B548
INS549	0000/071692/001		549	N B549 M	N B549
INS550	0000/071782/001		550	N B550 M	N B550
INS551	0000/071951/001		551	N B551 M	N B551
INS552	0000/073214/001		552	N B552 M	N B552
INS553	0000/078670/001		554	N B554 M	N B554
INS554	0000/079839/001		556	N B556 M	N B556
INS555	0000/081381/001		557	N B557 M	N B557
INS556	0000/083199/001		559	N B559 M	N B559
INS557	0000/083200/001		560	N B560 M	N B560
INS558	0000/083991/001		561	N B561 M	N B561
INS559	0000/084101/001		562	N B562 M	N B562
INS560	0000/084763/001		565	N B565 M	N B565
INS561	0000/085226/001		566	N B566 M	N B566
INS562	0000/085705/001		568	N B568 M	N B568
INS563	0000/086167/001		569	N B569 M	N B569
INS564	0000/086362/001		570	N B570 M	N B570
INS565	0000/086928/001		571	N B571 M	N B571
INS566	0000/083953/001		572	N B572 M	N B572
INS567	0000/004115/001		574	N B574 M	N B574
INS568	0000/006037/001		576	N B576 M	N B576
INS569	0000/024928/001		578	N B578 M	N B578
INS570	0000/095076/001		579	N B579 M	N B579
INS571	0083/004234/001		581	N B581 M	N B581
INS572	0083/004464/001		582	N B582 M	N B582
INS573	0083/004490/001		583	N B583 M	N B583
INS574	0083/004811/001		584	N B584 M	N B584
INS575	0083/004876/001		585	N B585 M	N B585
INS576	0083/004989/001		586	N B586 M	N B586
INS577	0083/005180/001		587	N B587 M	N B587
INS578	0083/005668/001		588	N B588 M	N B588
INS579	0083/006013/001		589	N B589 M	N B589
INS580	0083/006118/001		590	N B590 M	N B590
INS581	0076/006192/001		591	N B591 M	N B591
INS582	0076/006193/001		592	N B592 M	N B592

Table 73. Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl, Rundatabas *= Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS583	0104/001753/001		615	N B615 M	N B615
INS584	0076/021250/001		616	N B616 M	N B616
INS585	0104/001752/001		617	N B617 M	N B617
INS586	0110/000373/001		619	N B619 M	N B619
INS587	0110/000721/001		620	N B620 M	N B620
INS588	0110/001230/001		621	N B621 M	N B621
INS589	0110/001544/001		622	N B622 M	N B622
INS590	0110/001641/001		623	N B623 M	N B623
INS591	0110/001701/001		624	N B624 M	N B624
INS592	0110/001711/001		625	N B625 M	N B625
INS593	0110/003244/001		626	N B626 M	N B626
INS594	0110/003415/001		627	N B627 M	N B627
INS595	0110/003490/001		628	N B628 M	N B628
INS596	0110/005500/001		629	N B629 M	N B629
INS597	0110/005935/001		630	N B630 M	N B630
INS598	0000/006802/001		632	N B632 M	N B632
INS599	0000/016796/001		633	N B633 M	N B633
INS600	0000/017042/001		634	N B634 M	N B634
INS601	0000/022759/001		635	N B635 M	N B635
INS602	0000/054158/001		637	N B637 M	N B637
INS603	0000/071730/001		638	N B638 M	N B638
INS604	0000/076765/001		639	N B639 M	N B639
INS605	0000/076845/001		640	N B640 M	N B640
INS606	0000/077161/001		641	N B641 M	N B641
INS607	0000/079576/001		642	N B642 M	N B642
INS608	0000/079975/001		643	N B643 M	N B643
INS609	0000/081002/001		644	N B644 M	N B644
INS610	0000/089786/001		645	N B645 M	N B645
INS611	0076/012886/001		646	N B646 M	N B646
INS612	0076/022393/001		647	N B647 M	N B647
INS613	0076/022756/001		648	N B648 M	N B648
INS614	0083/005639/001		649	N B649 M	N B649
INS615	0083/006210/001		650	N B650 M	N B650
INS616	0090/001131/001		652	N B652 M	N B652
INS617	0115/000003/001		653	N B653 M	N B653
INS618	0000/021542/001		654	N B654 M	N B654
INS619	0000/074605/001		656	N B656 M	N B656
INS620	0000/087107/001		657	N B657 M	N B657
INS621	0237/001518/001		658	N B658 M	N B658
INS622	0237/012219/001		660	N B660 M	N B660
INS623	0342/000081/001		661	N B661 M	N B661
INS624	0000/016253/001		662	N B662 M	N B662

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas = *Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS625	0000/077726/001		663	N B663 M	N B663
INS626	0076/004706/001		664	N B664 $M	N B664
INS627	0346/001917/001		666	N B666 M	N B666
INS628	0346/002665/001		667	N B667 M	N B667
INS629	0346/003548/001		668	N B668 M	N B668
INS630	0246/004181/001		669	N B669 M	N B669
INS631	0000/073291/001		671	N B671 M	N B671
INS632	0000/045745/001		672	N B672 M	N B672
INS633	0000/073460/001		31		
INS634	0000/012289/001		54		
INS635	0000/015178/001		83		
INS636	0000/016219/001		96		
INS637	0000/016310/001		97		
INS638	0000/017611/001		120		
INS639	0000/017890/001		125		
INS640	0000/018255/001		137		
INS641	0000/018456/001		141		
INS642	0000/018242/001		144		
INS643	0000/019607/001		166		
INS644	0000/021266/001		186		
INS645	0000/022338/001		212		
INS646	0000/025430/001		224		
INS647	0000/025681/001		231		
INS648	0000/025903/001		232		
INS649	0000/026110/001		234		
INS650	0000/029586/001		278		
INS651	0000/030428/001		299		
INS652	0000/030751/001		312		
INS653	0000/032076/001		359		
INS654	0000/032641/001		363		
INS655	0000/044995/001		484		
INS656	0000/045931/001		486		
INS657	0000/052260/001		498		
INS658	0000/053066/001		507		
INS659	0000/058575/001		517		
INS660	0000/058657/001		519		
INS661	0003/000809/001		545		
INS662	0000/082204/001		558		
INS663	0000/005691/001		575		
INS664	0083/004135/001		580		
INS665	0076/008102/001		618		
INS666	0110/005953/001		631		

Table 73. *Complete list of inventory numbers. "Museum" = Universitetsmuseet Bergen (also called BRM-number), "NIYR VI" = NIYR VI, "Bergen" = Liestøl,* Rundatabas = *Samnordisk runtextdatabas. "Runor" = link to web application.*

TAKERUN	Museum	*NIYR VI*	Bergen	*Rundatabas*	Runor
INS667	0000/045047/001		636		
INS668	0086/000426/001		651		
INS669	0000/057189/001		655		
INS670	0237/012218/001		659		
INS671	0346/000186/001		665		
INS672	0346/004200/001		670		
INS673	0000/093321/001				
INS674	0000/003097/001				
INS675	0000/027301/001				
INS676	B/007097/0b/01				
INS677	0000/064155/001				

B Tables

Table 74. Character encoding in Gullskoen and Gullhornet with the runic characters occupying the slots reserved for other characters in today's Unicode Standard.

Code point	Name of sign supposed to be represented	Gullskoen	Gullhornet
0024	DOLLAR SIGN	ᛓ	ᛇ
0025	PERCENT SIGN	Я	ᛝ
0026	AMPERSAND	ᚱ	ᛊ
0028	LEFT PARENTHESIS	ᚤ	ᛞ
0029	RIGHT PARENTHESIS	.	.
002A	ASTERISK	ᚴ	
002B	PLUS SIGN	ᚠ	
002C	COMMA	⁘	▯
002E	FULL STOP	.	·
0030	DIGIT ZERO	↓	ᛞ
0031	DIGIT ONE	ᚹ	ᛃ
0032	DIGIT TWO	ᛚ	ᛊ
0033	DIGIT THREE	᛭	ᚣ
0034	DIGIT FOUR	ᛐ	ᛇ
0035	DIGIT FIVE	ᚱ	ᛜ
0036	DIGIT SIX	ᚱ	ᛉ
0037	DIGIT SEVEN	ᛁ	ᛦ
0038	DIGIT EIGHT	ᛌ	ᛯ
0039	DIGIT NINE	.	.
003A	COLON	:	:
003B	SEMICOLON	⁘	
003C	LESS-THAN SIGN	⌒	⌒
003D	EQUALS SIGN	↕	▫
003E	GREATER-THAN SIGN	⌒	⌒
003F	QUESTION MARK	Ī	
0040	COMMERCIAL AT	ᚦ	
0041	LATIN CAPITAL LETTER A	ᚭ	ᚨ
0042	LATIN CAPITAL LETTER B	ᛒ	ᛒ
0043	LATIN CAPITAL LETTER C	ᛀ	ᚳ
0044	LATIN CAPITAL LETTER D	ᛑ	ᛞ
0045	LATIN CAPITAL LETTER E	ᛂ	ᚢ
0046	LATIN CAPITAL LETTER F	ᚠ	ᚠ
0047	LATIN CAPITAL LETTER G	ᚵ	ᚸ
0048	LATIN CAPITAL LETTER H	ᚼ	ᚻ
0049	LATIN CAPITAL LETTER I	ᛐ	ᛡ
004A	LATIN CAPITAL LETTER J	ᛄ	ᚼ
004B	LATIN CAPITAL LETTER K	ᚴ	ᛉ
004C	LATIN CAPITAL LETTER L	ᛛ	ᛄ
004D	LATIN CAPITAL LETTER M	ᛘ	
004E	LATIN CAPITAL LETTER N	ᚾ	ᚿ

Table 74. *Character encoding in Gullskoen and Gullhornet with the runic characters occupying the slots reserved for other characters in today's Unicode Standard.*

Code point	Name of sign supposed to be represented	Gullskoen	Gullhornet
004F	LATIN CAPITAL LETTER O	ᚯ	ᚩ
0050	LATIN CAPITAL LETTER P	ᛕ	ᚱ
0051	LATIN CAPITAL LETTER Q	ᚦ	ᚦ
0052	LATIN CAPITAL LETTER R	ᚱ	ᚱ
0053	LATIN CAPITAL LETTER S	ᛌ	ᛋ
0054	LATIN CAPITAL LETTER T	ᛏ	ᚴ
0055	LATIN CAPITAL LETTER U	ᚢ	ᚢ
0056	LATIN CAPITAL LETTER V	ᚡ	ᚤ
0057	LATIN CAPITAL LETTER W	ᚹ	ᚹ
0058	LATIN CAPITAL LETTER X	ᛋ	ᚤ
0059	LATIN CAPITAL LETTER Y	ᛦ	ᛉ
005A	LATIN CAPITAL LETTER Z	ᛐ	ᛦ
005B	LEFT SQUARE BRACKET	ᚺ	ᛢ
005C	REVERSE SOLIDUS	ᚾ	
005D	RIGHT SQUARE BRACKET	.	.
0061	LATIN SMALL LETTER A	ᛆ	ᚨ
0062	LATIN SMALL LETTER B	ᛒ	ᛒ
0063	LATIN SMALL LETTER C	ᛋ	ᚳ
0064	LATIN SMALL LETTER D	ᛑ	ᛞ
0065	LATIN SMALL LETTER E	ᛂ	ᛖ
0066	LATIN SMALL LETTER F	ᚠ	ᚠ
0067	LATIN SMALL LETTER G	ᚵ	ᚷ
0068	LATIN SMALL LETTER H	ᚼ	ᚺ
0069	LATIN SMALL LETTER I	ᛁ	ᛁ
006A	LATIN SMALL LETTER J	ᛅ	ᛃ
006B	LATIN SMALL LETTER K	ᚴ	ᚲ
006C	LATIN SMALL LETTER L	ᛚ	ᛚ
006D	LATIN SMALL LETTER M	ᛘ	ᛗ
006E	LATIN SMALL LETTER N	ᚿ	ᚾ
006F	LATIN SMALL LETTER O	ᚮ	ᛟ
0070	LATIN SMALL LETTER P	ᛔ	ᛈ
0071	LATIN SMALL LETTER Q	ᚦ	ᚦ
0072	LATIN SMALL LETTER R	ᚱ	ᚱ
0073	LATIN SMALL LETTER S	ᛌ	ᛊ
0074	LATIN SMALL LETTER T	ᛐ	ᛏ
0075	LATIN SMALL LETTER U	ᚢ	ᚢ
0076	LATIN SMALL LETTER V	ᚡ	ᚤ
0077	LATIN SMALL LETTER W	ᚹ	ᚹ
0078	LATIN SMALL LETTER X	ᚼ	
0079	LATIN SMALL LETTER Y	ᛦ	ᛉ
007A	LATIN SMALL LETTER Z	ᛄ	ᛇ
007B	LEFT CURLY BRACKET	ᛧ	
007C	VERTICAL LINE	ᛙ	ᛟ

Table 74. Character encoding in Gullskoen and Gullhornet with the runic characters occupying the slots reserved for other characters in today's Unicode Standard.

Code point	Name of sign supposed to be represented	Gullskoen	Gullhornet
007D	RIGHT CURLY BRACKET	·	
00A1	INVERTED EXCLAMATION MARK	ᚯ	
00A2	CENT SIGN	ᛩ	
00A3	POUND SIGN	ᚨ	
00A4	CURRENCY SIGN	↓	
00A5	YEN SIGN	ᛂ	
00A7	SECTION SIGN	ᛧ	○
00A9	COPYRIGHT SIGN	ᚽ	ᛦ
00AA	FEMININE ORDINAL INDICATOR	ᛰ	
00AB	LEFT-POINTING DOUBLE ANGLE QUOTATION MARK	ᛪ	
00AC	NOT SIGN	ᛂ	
00AE	REGISTERED SIGN	ᛕ	
00B0	DEGREE SIGN	D	
00B1	PLUS-MINUS SIGN	᛭	
00B6	PILCROW SIGN	¶	¶
00BA	MASCULINE ORDINAL INDICATOR	ᛂ	
00BB	RIGHT-POINTING DOUBLE ANGLE QUOTATION MARK	ᚫ	ᛒ
00C0	LATIN CAPITAL LETTER A WITH GRAVE	⸜	+
00C1	LATIN CAPITAL LETTER A WITH ACUTE	ᛆ	ᛜ
00C2	LATIN CAPITAL LETTER A WITH CIRCUMFLEX	ᛯ	ʒ
00C4	LATIN CAPITAL LETTER A WITH DIAERESIS	ᚼ	ᛞ
00C7	LATIN CAPITAL LETTER C WITH CEDILLA	ᛔ	∝
00C8	LATIN CAPITAL LETTER E WITH GRAVE	ᛂ	
00C9	LATIN CAPITAL LETTER E WITH ACUTE	⸌	
00CA	LATIN CAPITAL LETTER E WITH CIRCUMFLEX	⁚	ᛘ
00CB	LATIN CAPITAL LETTER E WITH DIAERESIS	⁚	
00CC	LATIN CAPITAL LETTER I WITH GRAVE	ᛁ	
00CD	LATIN CAPITAL LETTER I WITH ACUTE	ᛏ	
00CE	LATIN CAPITAL LETTER I WITH CIRCUMFLEX	⸌	
00CF	LATIN CAPITAL LETTER I WITH DIAERESIS	ᛁ	
00C0	LATIN CAPITAL LETTER A WITH GRAVE	⸜	
00C1	LATIN CAPITAL LETTER A WITH ACUTE	ᛆ	
00C2	LATIN CAPITAL LETTER A WITH CIRCUMFLEX	ᛯ	
00C4	LATIN CAPITAL LETTER A WITH DIAERESIS	ᚼ	
00C7	LATIN CAPITAL LETTER C WITH CEDILLA	ᛔ	
00C8	LATIN CAPITAL LETTER E WITH GRAVE	ᛂ	
00C9	LATIN CAPITAL LETTER E WITH ACUTE	⸌	
00CA	LATIN CAPITAL LETTER E WITH CIRCUMFLEX	⁚	
00CB	LATIN CAPITAL LETTER E WITH DIAERESIS	⁚	
00CC	LATIN CAPITAL LETTER I WITH GRAVE	ᛁ	
00CD	LATIN CAPITAL LETTER I WITH ACUTE	ᛏ	

Table 74. *Character encoding in Gullskoen and Gullhornet with the runic characters occupying the slots reserved for other characters in today's Unicode Standard.*

Code point	Name of sign supposed to be represented	Gullskoen	Gullhornet
00CE	LATIN CAPITAL LETTER I WITH CIRCUMFLEX	ᛌ	
00CF	LATIN CAPITAL LETTER I WITH DIAERESIS	ᛁ	
00D2	LATIN CAPITAL LETTER O WITH GRAVE	ᛚ	
00D3	LATIN CAPITAL LETTER O WITH ACUTE	ᛕ	ᚫ
00D4	LATIN CAPITAL LETTER O WITH CIRCUMFLEX	ᛑ	
00D6	LATIN CAPITAL LETTER O WITH DIAERESIS	ᚯ	ᛰ
00D8	LATIN CAPITAL LETTER O WITH STROKE	ᚯ	ᛊ
00D9	LATIN CAPITAL LETTER U WITH GRAVE	ᛉ	
00DA	LATIN CAPITAL LETTER U WITH ACUTE	ᚵ	
00DB	LATIN CAPITAL LETTER U WITH CIRCUMFLEX	ᛁ	↓
00DC	LATIN CAPITAL LETTER U WITH DIAERESIS	ᚢ	
00DF	LATIN SMALL LETTER SHARP S	ᛰ	ᚴ
00E0	LATIN SMALL LETTER A WITH GRAVE	ᛌ	ᛏ
00E1	LATIN SMALL LETTER A WITH ACUTE	ᛆ	ᛇ
00E2	LATIN SMALL LETTER A WITH CIRCUMFLEX	ᛆ	ᛊ
00E4	LATIN SMALL LETTER A WITH DIAERESIS	ᚯ	ᛊ
00E5	LATIN SMALL LETTER A WITH RING ABOVE	ᛒ	ᛊ
00E6	LATIN SMALL LETTER AE	ᛅ	ᚨ
00E7	LATIN SMALL LETTER C WITH CEDILLA	ᚧ	~
00E8	LATIN SMALL LETTER E WITH GRAVE	ᛌ	ᚺ
00E9	LATIN SMALL LETTER E WITH ACUTE	ᛂ	ᛞ
00EA	LATIN SMALL LETTER E WITH CIRCUMFLEX	ᚧ	ᛝ
00F4	LATIN SMALL LETTER O WITH CIRCUMFLEX	ᛩ	ᛰ
00F6	LATIN SMALL LETTER O WITH DIAERESIS	ᚯ	ᛟ
00F7	DIVISION SIGN	ᚦ	ᚾ
00F8	LATIN SMALL LETTER O WITH STROKE	ᚯ	ᛊ
00F9	LATIN SMALL LETTER U WITH GRAVE		ᛦ
00FA	LATIN SMALL LETTER U WITH ACUTE	ᛅ	ᛩ
00FB	LATIN SMALL LETTER U WITH CIRCUMFLEX	ᛚ	ᛉ
00FC	LATIN SMALL LETTER U WITH DIAERESIS	ᚢ	Λ
0178	LATIN CAPITAL LETTER Y WITH DIAERESIS	ᛡ	
0192	LATIN SMALL LETTER F WITH HOOK	ᚠ	

Table 75. *All slots of the Unicode code block Runic with the respective characters displayed in the fonts Junicode and Segoe UI Historic.*

Code Point	Character Name	Junicode	Segoe
16A0	RUNIC LETTER FEHU FEOH FE F	ᚠ	ᚠ
16A1	RUNIC LETTER V	ᚡ	ᚡ
16A2	RUNIC LETTER URUZ UR U	ᚢ	ᚢ
16A3	RUNIC LETTER YR	ᚣ	ᚣ
16A4	RUNIC LETTER Y	ᚤ	ᚤ

Table 75. *All slots of the Unicode code block Runic with the respective characters displayed in the fonts Junicode and Segoe UI Historic.*

Code Point	Character Name	Junicode	Segoe
16A5	RUNIC LETTER W	ᚥ	ᚥ
16A6	RUNIC LETTER THURISAZ THURS THORN	ᚦ	ᚦ
16A7	RUNIC LETTER ETH	ᚧ	ᚧ
16A8	RUNIC LETTER ANSUZ A	ᚨ	ᚨ
16A9	RUNIC LETTER OS O	ᚩ	ᚩ
16AA	RUNIC LETTER AC A	ᚪ	ᚪ
16AB	RUNIC LETTER AESC	ᚫ	ᚫ
16AC	RUNIC LETTER LONG-BRANCH-OSS O	ᚬ	ᚬ
16AD	RUNIC LETTER SHORT-TWIG-OSS O	ᚭ	ᚭ
16AE	RUNIC LETTER O	ᚮ	ᚮ
16AF	RUNIC LETTER OE	ᚯ	ᚯ
16B0	RUNIC LETTER ON	ᚰ	ᚰ
16B1	RUNIC LETTER RAIDO RAD REID R	ᚱ	ᚱ
16B2	RUNIC LETTER KAUNA	ᚲ	ᚲ
16B3	RUNIC LETTER CEN	ᚳ	ᚳ
16B4	RUNIC LETTER KAUN K	ᚴ	ᚴ
16B5	RUNIC LETTER G	ᚵ	ᚵ
16B6	RUNIC LETTER ENG	ᚶ	ᚶ
16B7	RUNIC LETTER GEBO GYFU G	ᚷ	ᚷ
16B8	RUNIC LETTER GAR	ᚸ	ᚸ
16B9	RUNIC LETTER WUNJO WYNN W	ᚹ	ᚹ
16BA	RUNIC LETTER HAGLAZ H	ᚺ	ᚺ
16BB	RUNIC LETTER HAEGL H	ᚻ	ᚻ
16BC	RUNIC LETTER LONG-BRANCH-HAGALL H	ᚼ	ᚼ
16BD	RUNIC LETTER SHORT-TWIG-HAGALL H	ᚽ	ᚽ
16BE	RUNIC LETTER NAUDIZ NYD NAUD N	ᚾ	ᚾ
16BF	RUNIC LETTER SHORT-TWIG-NAUD N	ᚿ	ᚿ
16C0	RUNIC LETTER DOTTED-N	ᛀ	ᛀ
16C1	RUNIC LETTER ISAZ IS ISS I	ᛁ	ᛁ
16C2	RUNIC LETTER E	ᛂ	ᛂ
16C3	RUNIC LETTER JERAN J	ᛃ	ᛃ
16C4	RUNIC LETTER GER	ᛄ	ᛄ
16C5	RUNIC LETTER LONG-BRANCH-AR AE	ᛅ	ᛅ
16C6	RUNIC LETTER SHORT-TWIG-AR A	ᛆ	ᛆ
16C7	RUNIC LETTER IWAZ EOH	ᛇ	ᛇ
16C8	RUNIC LETTER PERTHO PEORTH P	ᛈ	ᛈ
16C9	RUNIC LETTER ALGIZ EOLHX	ᛉ	ᛉ
16CA	RUNIC LETTER SOWILO S	ᛊ	ᛊ
16CB	RUNIC LETTER SIGEL LONG-BRANCH-SOL S	ᛋ	ᛋ
16CC	RUNIC LETTER SHORT-TWIG-SOL S	ᛌ	ᛌ
16CD	RUNIC LETTER C	ᛍ	ᛍ
16CE	RUNIC LETTER Z	ᛎ	ᛎ
16CF	RUNIC LETTER TIWAZ TIR TYR T	ᛏ	ᛏ

Table 75. All slots of the Unicode code block Runic with the respective characters displayed in the fonts Junicode and Segoe UI Historic.

Code Point	Character Name	Junicode	Segoe
16D0	RUNIC LETTER SHORT-TWIG-TYR T	ᛐ	ᛐ
16D1	RUNIC LETTER D	ᛑ	ᛑ
16D2	RUNIC LETTER BERKANAN BEORC BJARKAN B	ᛒ	ᛒ
16D3	RUNIC LETTER SHORT-TWIG-BJARKAN B	ᛓ	ᛓ
16D4	RUNIC LETTER DOTTED-P	ᛔ	ᛔ
16D5	RUNIC LETTER OPEN-P	ᛕ	ᛕ
16D6	RUNIC LETTER EHWAZ EH E	ᛖ	ᛖ
16D7	RUNIC LETTER MANNAZ MAN M	ᛗ	ᛗ
16D8	RUNIC LETTER LONG-BRANCH-MADR M	ᛘ	ᛘ
16D9	RUNIC LETTER SHORT-TWIG-MADR M	ᛙ	ᛙ
16DA	RUNIC LETTER LAUKAZ LAGU LOGR L	ᛚ	ᛚ
16DB	RUNIC LETTER DOTTED-L	ᛛ	ᛛ
16DC	RUNIC LETTER INGWAZ	ᛜ	ᛜ
16DD	RUNIC LETTER ING	ᛝ	ᛝ
16DE	RUNIC LETTER DAGAZ DAEG D	ᛞ	ᛞ
16DF	RUNIC LETTER OTHALAN ETHEL O	ᛟ	ᛟ
16E0	RUNIC LETTER EAR	ᛠ	ᛠ
16E1	RUNIC LETTER IOR	ᛡ	ᛡ
16E2	RUNIC LETTER CWEORTH	ᛢ	ᛢ
16E3	RUNIC LETTER CALC	ᛣ	ᛣ
16E4	RUNIC LETTER CEALC	ᛤ	ᛤ
16E5	RUNIC LETTER STAN	ᛥ	ᛥ
16E6	RUNIC LETTER LONG-BRANCH-YR	ᛦ	ᛦ
16E7	RUNIC LETTER SHORT-TWIG-YR	ᛧ	ᛧ
16E8	RUNIC LETTER ICELANDIC-YR	ᛨ	ᛨ
16E9	RUNIC LETTER Q	ᛩ	ᛩ
16EA	RUNIC LETTER X	ᛪ	ᛪ
16EB	RUNIC SINGLE PUNCTUATION	᛫	᛫
16EC	RUNIC MULTIPLE PUNCTUATION	᛬	᛬
16ED	RUNIC CROSS PUNCTUATION	᛭	᛭
16EE	RUNIC ARLAUG SYMBOL	ᛮ	ᛮ
16EF	RUNIC TVIMADUR SYMBOL	ᛯ	ᛯ
16F0	RUNIC BELGTHOR SYMBOL	ᛰ	ᛰ
16F1	RUNIC LETTER K	⊠	☐
16F2	RUNIC LETTER SH	⊠	☐
16F3	RUNIC LETTER OO	⊠	☐
16F4	RUNIC LETTER FRANKS CASKET OS	⊠	☐
16F5	RUNIC LETTER FRANKS CASKET IS	⊠	☐
16F6	RUNIC LETTER FRANKS CASKET EH	⊠	☐
16F7	RUNIC LETTER FRANKS CASKET AC	⊠	☐
16F8	RUNIC LETTER FRANKS CASKET AESC	⊠	☐
16F9	<reserved>		
16FA	<reserved>		

Table 75. All slots of the Unicode code block Runic with the respective characters displayed in the fonts Junicode and Segoe UI Historic.

Code Point	Character Name	Junicode	Segoe
16FB	<reserved>		
16FC	<reserved>		
16FD	<reserved>		
16FE	<reserved>		
16FF	<reserved>		

Table 76. Sound values ascribed to the characters from Gullskoen (following Haugen 2000).

Character	Long-branch	Short-twig	Staveless	Middle Ages
ᚠ	f	f		f
ᚠ	f	f		f
ᛂ			f	
ᛂ			f	
ᚠ	f			
ᛩ				f
ᛆ				f
ᚠ				f
ᚢ	u			u
ᚢ	u	u		u
ᛍ			u	
ᚢ	u	u		u
ᚢ				u
ᚦ	þ	þ		þ
ᚦ	þ	þ		þ
ᛁ			þ	
ᚦ		þ		þ
ᚦ	þ			þ
ᚦ				þ
ᚦ				þ
ᚧ				þ
ᚧ				ð
ᚧ				ð
ᛚ				ð
ᚭ		ą		o, ø/ǫ
ᚱ	r	r		r
ᚱ	r	r		r
ᚱ	r	r		r
ᛍ			r	
ᚱ				r
ᚱ				r
ᚱ				r
ᚱ				r

Table 76. Sound values ascribed to the characters from Gullskoen (following Haugen 2000).

Character	Long-branch	Short-twig	Staveless	Middle Ages
ᛕ				r
ᚵ				g
ᚵ				g
ᚵ				g
ᚴ	k	k		k, q
ᚴ	k	k		k, q
ꞁ			k	
ᛘ				k, q
ᚽ		h		e
ı			h	
ᚼ	h			h
ᛡ				h
ᚾ	n			
ᚿ	n			n
⸌			n	
ᚿ				n
ᚾ				n
ᛁ	i	i		i
ᛁ			i	
ᛂ		h		e
ᛂ				e
ᛅ	a	a		æ
ᛆ		a		
⸍			a	
ᛆ				a
ᛆ				a
ᛆ				a
ᛆ				a
ᚬ	ą	ą		o
ᚭ	ą			o
ᚯ	ą	ą		ø, ǫ
⸌			ą	
ᛌ		s		s, c, z
ᛋ	s			c, s, z
ᛋ	s			c, s, z
ı			Stavlaus	
ᛌ				s, c, z
ᛌ				s, c, z
ᛂ				s
ᛂ				s
ᛌ				s
ᛋ	s			s
ᛏ	t			
ᛐ		t		t

Table 76. *Sound values ascribed to the characters from Gullskoen (following Haugen 2000).*

Character	Long-branch	Short-twig	Staveless	Middle Ages
ᛐ		t		t
⸍			t	
ᛑ				d
ᛑ				d
ᛑ				d
ᛑ				d
ᛑ				d
ᛒ	b			b
ᛒ	b			b
ᛓ		b, ą		
⸝			b	
ᚹ				b
ь				b
ᛔ				p
ᛘ	m			m
Ψ	m			m
ᛙ	m			
ᛙ		m		
ᛙ		m		
⁚			m	
ᛚ	l	l		l
⸌			l	
ᛚ				l
ᛛ				l
ᛛ				l
ᛦ				R, y
ᛦ				R, y
ᚤ				y
ᛨ				y
↕				y
ᛡ				y
ᚭ	ą	b		ø, ǫ
ᚬ	ą	ą		ø, ǫ
ᚭ				ø, ǫ
ᚭ				ø, ǫ
ᚭ				ø, ǫ
ᚭ				ø, ǫ
ᚯ				ø, ǫ
ᚵ				ŋg
ᚮ		ą		o
ᚴ				k, p
K				k, p
ᛕ				p
ᛩ				q

Table 76. Sound values ascribed to the characters from Gullskoen (following Haugen 2000).

Character	Long-branch	Short-twig	Staveless	Middle Ages
ᛩ				q
ᛧ		R		s
⁚			R	
ᚡ				v
ᚠ				v
ᚥ				w
ᛪ				x
ᛍ				x
ᛍ		x		
ᚷ				x
↓				x
↓				z

Table 77. *List of all idionyms in* IDIONYM*, sorted alphabetically (C.28), and their tokens in the various corpora. It includes all potential idionyms suggested by the scholars working with the material, but not attested before, and those normalisations where I was unable to figure out which OWN idionym they supposedly represent.*

Normalised	Gender	Idionym	Byname	Tokens DN	Tokens DI	Count objects	Tokens + invocations	Tokens - invocations	Lind	Country
Abed-Nego	m	1	0			1	1	0		
Agi	m	1	0	2	0	1	1	1	N	P
Agnbjǫrg	f	1	0			1	1	1		
Alfvardr	m	1	0			1	1	1		
Amor	m	1	0			1	1	0		
Ámundi	m	1	0	23	11	2	2	2		I
Án(n)	m	1	0	25	0	2	2	2		P
Andreas/Andrés	m	1	0	182	31	2	2	0		P
Áni	m	1	0	1	0	3	3	3		P
Anna	f	1	0	8	8	1	1	1		I
Anne	f	1	0			3	3	3		
Ari	m	1	0	30	203	2	2	2		I
Arnbjǫrg	f	1	0	48	0	1	1	1		N
Arnbjǫrn	m	1	0	297	83	1	1	1		I
Arnfinnr	m	1	0	356	68	1	1	1		P
Arni	m	1	0	89	41	12	13	13		I
Arnviðr	m	1	0	85	5	1	1	1		P
Ása	f	1	0	259	20	4	4	3		N
Ásbjǫrg	f	1	0	17	0	1	1	1		P
Ásgeirr	m	1	0	122	32	1	1	1		P
Ásgrímr	m	1	0	46	169	1	1	1		I
Áslákr	m	1	0	971	18	1	1	1		N
Ásmundr	m	1	0	494	94	1	1	1		P
Auðmundr	m	1	0			1	1	1		
Auðr	mf	1	0	0	0	2	2	2		
Auðun	m	1	0	854	110	1	1	1		N
Bárðr	m	1	0	262	12	2	2	2		N
Benedikt	m	1	0	471	144	3	3	3		I
Benedikta	f	1	0	1	0	1	1	1		P
Bergsveinn	m	1	0	97	2	1	1	1	N	N
Bergþóra	f	1	0	0	0	1	1	1		
Bergþórr	m	1	0	259	91	2	2	2		I
Birgir	m	1	0	154	6	1	1	1		N
Bjarni/Biarni	m	1	0	89	7	2	2	2		P
Bjǫrn/Biǫrn	m	1	0	279	37	1	1	1		P
Bóthildr	f	1	0	23	0	1	1	1		P
Bótleifr	m	1	0			1	1	1		
Bótolfr	m	1	0	440	15	1	1	1		N
Brandr	m	1	0	100	32	1	1	1		I
Bubba	f	0	0			1	1	1		
Búi	m	1	0	3	6	1	1	1		I
Búr-Almarr	m	1	0			1	1	1		
Christus	m	1	1			7	7	0		
Constantinus	m	1	0			1	1	0		
Didrik	m	1	0	19	12	1	1	1	N	I
Dionysius	m	1	0			1	2	0		
Egill	m	1	0	133	123	1	1	1		I
Einarr	m	1	0	127	13	4	5	5		P
Eindriði	m	1	0	242	68	5	6	6		I
Einri	m	1	0			1	1	1		
Eiríkr	m	1	0	464	40	11	11	11		N
Eldjarn/Eldiárn	m	1	1	0	12	1	1	1	I	I
Elisabet(h)	f	1	0	35	1	1	1	0	N	P
Erlendr	m	1	0	733	188	5	6	6		I
Erlingr	m	1	0	1435	49	2	2	2		N
Eygísl/Eygils	m	1	0	8	0	1	1	1	N	P
Eyjolfr/Eyiólfr	m	1	0	137	56	2	2	2		I
Eysteinn	m	1	0	309	1	3	3	3		N
Eyvindr	m	1	0	643	11	1	1	1		N
Finnr	m	1	0	319	93	4	5	5		I
Fólkvarðr	m	1	0	48	0	1	1	1	N	N

Table 77. *List of all idionyms in* IDIONYM*, sorted alphabetically (C.28), and their tokens in the various corpora, including potential idionyms not attested before, and those normalisations where I was unable to figure out which OWN idionym they supposedly represent.*

Normalised	Gender	Idionym	Byname	Tokens DN	Tokens DI	Count objects	Tokens + invocations	Tokens - invocations	Lind	Country
Gabriel	m	1	0	6	0	1	1	0	N	P
Gísl	m	1	0	4	46	1	1	1		I
Glúmr	m	1	0	3	5	1	1	1		I
Grímnir	m	1	0	0	0	1	1	0	M	
Grímr	m	1	0	164	16	2	3	3		P
Guðmundr	m	1	0	377	62	3	3	3		P
Guðríðr	f	1	0	208	62	1	1	1		I
Guðrún	f	1	0	268	24	1	1	1		N
Guðsteinn	m	1	0	1	0	1	1	1	N	P
Guðþormr	m	1	0	363	84	1	1	1		P
Gunna	f	1	0	24	0	1	1	1	N	P
Gunnarr	m	1	0	155	14	12	13	13		P
Gunnhildr	f	1	0	184	17	1	1	1		P
Gunnsteinn	m	1	0	1	9	1	1	1		I
Gusir	m	1	0	0	0	1	1	1		
Gussir		0	0			1	1	1		
Gyða	f	1	0	48	5	2	2	2		P
Gyrðir		0	0			1	1	1		
Gyrðr	m	1	0	330	5	1	1	1		N
Gyrid		0	0			1	1	1		
Hafdjarfr	m	1	0	0	0	1	1	1	N	
Hafgrímr	m	1	0	0	1	1	1	1		P
Hákon	m	1	0	210	131	1	1	1		I
Hálfdan	m	1	0	33	41	1	1	1		I
Hallbjǫrg	f	1	0	4	1	1	1	1		P
Halldórr	m	1	0	365	6	2	2	2		N
Hallgísl/Hallgils	m	1	0	0	0	1	1	1	I	
Halli	m	1	0	121	13	2	2	2		P
Hallkatla	f	1	0	3	0	2	2	2		P
Hallkell	m	1	0	154	32	1	1	1		P
Hallsteinn	m	1	0	353	47	1	1	1		P
Hallvarðr	m	1	0	768	14	4	4	4		N
Haraldr	m	1	0	600	24	2	2	2		N
Hávarðr	m	1	0	852	23	1	1	1		N
Hávarr	m	0	0	0	1	1	1	1		P
Heðinn	m	1	0	27	3	1	1	1		P
Heinrekr	m	1	0	261	30	3	3	3		P
Helga	f	1	0	139	4	1	1	1		N
Helgi	m	1	0	283	8	3	3	3		N
Herikr	m	1	0			1	1	1		
Hermaðr	m	1	1			1	3	3		
Hermann	m	1	1	60	15	1	3	3		P
Holmr	m	1	0	26	0	1	1	1	N	P
Hrólfr (Rolfr)	m	1	0	430	24	1	1	1		N
Illugi	m	1	0	0	147	1	1	1	I	I
Ími	m	1	0	0	5	1	2	1	I	I
Inga	f	1	0	32	4	1	1	1		P
Ingibjǫrg/Ingibiǫrg	f	1	0	537	108	3	3	3		P
Ingimundr	m	1	0	165	154	1	1	1		I
Ingiríðr	f	1	0	251	30	1	1	1		P
Ingjaldr/Ingialdr	m	1	0	195	31	1	1	1		P
Ió(h)an/Jó(h)an	m	1	0	135	25	6	6	6		P
Ióðgeirr/Jóðgeirr	m	1	0	8	0	1	1	1	N	P
Iógeirr/Jógeirr	m	1	0	6	0	1	1	1	N	P
Ívarr	m	1	0	283	9	4	4	4		N
Jesus	m	1	0			4	4	0		
Johannes	m	1	0			8	8	0		
Jón	m	1	0			7	9	9		
Jórunn/Iórunn	f	1	0	156	12	1	1	1		N
Karl	m	1	0	308	25	1	1	1		N
Kárr	m	1	0	9	31	1	1	1		I

Table 77. *List of all idionyms in IDIONYM, sorted alphabetically (C.28), and their tokens in the various corpora, including potential idionyms not attested before, and those normalisations where I was unable to figure out which OWN idionym they supposedly represent.*

Normalised	Gender	Idionym	Byname	Tokens DN	Tokens DI	Count objects	Tokens + invocations	Tokens - invocations	Lind	Country
Kátr		0	1	2	0	1	1	1		P
Kattr		0	0			1	1	1		
Klas	m	1	0			1	1	1		
Klémetr	m	1	0	309	32	1	2	0		N
Kolbeinn	m	1	0	285	171	3	4	4		I
Kolbjǫrn	m	1	0	440	3	2	2	2		N
Kormakr	m	1	0	2	2	1	1	0		P
Kǫttr		0	0	0	0	1	1	1	F	
Lafranz	m	1	0	272	4	2	2	1		N
Ljótr/Liotr	m	1	0	47	61	2	2	2		I
Loðinn	m	1	0	270	11	2	2	2		N
Lúcia	f	1	0	21	0	2	2	2	N	P
Lukas	m	1	0	1	1	5	6	0		P
Lunaney	f	1	0			1	1	1		
Magnús	m	1	0	160	26	1	1	1		P
Malchus	m	1	0			2	2	0		
Margrét(a)	f	1	0	581	106	2	2	2		P
María	f	1	0	8	0	18	19	2	N	P
Markús	m	1	0	45	93	5	5	0		I
Markvarðr	m	1	0	40	0	1	1	1	N	P
Martinianus	m	1	0			1	1	0		
Mat(t)heus	m	1	0	3	20	4	5	0		I
Maximianus	m	1	0			2	2	0		
Mesak	m	1	0			1	1	0		
Michael/Mikiáll	m	1	0	156	23	2	2	0		P
Munán	m	1	0	30	0	1	1	1	N	P
Myttar		0	0			1	1	1		
Narfi	m	1	0	416	204	1	1	1		I
Nikulás/Nikolás	m	1	0	507	44	3	3	2		N
Oddr	m	1	0	331	92	1	1	1		I
Óðinn	m	1	0	8	0	2	3	0	M	P
Ǫgmundr	m	1	0	762	43	3	3	3		N
Ólafr	m	1	0	355	35	9	11	9		N
Ǫlrekr	m	1	0	3	0	1	1	1	N	P
Ǫlvir/Ølvir	m	1	0	128	6	1	1	1		N
Ǫnundr	m	1	0	763	31	1	1	1		N
Ormr	m	1	0	67	7	2	2	2		P
Ormríkr	m	1	0			1	1	1		
Óttarr	m	1	0	157	18	1	1	1		P
Ótto	m	1	0	84	2	1	1	1	N	N
Pálni	m	1	0	21	0	1	1	1	N	P
Pétr	m	1	0	368	17	2	2	1		N
Philomena	f	1	0			1	1	0		
Poppe	m	1	0			1	1	1		
Ragnarr	m	1	0	6	14	1	1	1	N	I
Ran	f	1	0	0	0	1	1	0	M	
Rannveig	f	1	0	211	21	3	3	3		P
Raphael	m	1	0			1	1	0		
Raumr	m	1	1	0	0			0	F	
Reiðarr	m	1	0			1	1	1		
Rúnolfr	m	1	0	31	171	1	1	1		I
Sadrak	m	1	0			1	1	0		
Sámr	m	1	0	1	0	3	3	3		P
Samson	m	1	0	13	0	1	1	1	N	P
Sægunni	m	1	0			1	1	1		
Serapion	m	1	0			1	1	0		
Sessi		0	0			1	1	1		
Sigbaldr	m	1	0			1	1	1		
Siggi	m	1	0	11	0	1	1	1	N	P
Sighvatr	m	1	0	209	96	1	1	1		I
Sigolfr/Sigólfr	m	1	0	1	0	1	1	1	N	P
Sigríðr	f	1	0	508	82	5	5	5		P

Table 77. *List of all idionyms in* IDIONYM*, sorted alphabetically (C.28), and their tokens in the various corpora, including potential idionyms not attested before, and those normalisations where I was unable to figure out which OWN idionym they supposedly represent.*

Normalised	Gender	Idionym	Byname	Tokens DN	Tokens DI	Count objects	Tokens + invocations	Tokens - invocations	Lind	Country
Sigurðr	m	1	0	1016	82	15	19	19		N
Sigvaldi	m	1	0			1	1	1		
Sigvaldr	m	1	0	27	0	2	2	2	N	P
Símon	m	1	0	463	47	3	3	3		N
Skeggi	m	1	0	22	58	1	1	1		I
Smiðr	m	1	0	97	3	1	1	1		N
Sǫlveig	f	1	0	11	49	1	1	1		I
Sørkviðr	m	1	0			1	1	1		
Sørkvir	m	1	0	54	7	1	1	1	N	P
Steinarr	m	1	0	407	3	1	1	1		N
Styrkárr	m	1	0	48	12	1	1	1		P
Sveinn	m	1	0	193	20	3	3	3		P
Sverðolfr	m	1	0			1	1	1		
Tast		0	1			1	1	1		
Tereus	m	1	0			1	1	0		
Thomás	m	1	0	201	116	1	1	0		I
Tobias	m	1	0			1	1	0		
Tonna	f	1	0			1	1	1		
Týhvatr/Tivatr	m	1	0	12	0	1	1	1	N	P
Týr	m	1	0	0	0	1	1	0	M	
Únás(s)	m	1	0	18	0	1	1	1		P
Vébrandr	m	1	0	11	1	1	1	1		P
Vémundr	m	1	0	14	8	1	1	1		I
Vígdís	f	1	0	4	26	1	1	1		I
Vígi	m	1	0	8	0	1	3	3		P
Vilhelmus/-Vilhiálmr	m	1	0	219	73	1	1	1		I
Yggjar/Yggr	m	1	0	0	0	1	1	0	M	
Yngvildr	f	1	0	0	88	1	1	1		I
Þiðrikr	m	1	0			1	1	1		
Þjóðarr	m	1	0	0	0	1	1	1		
Þjóðgeir-r/Þióðgeirr	m	1	0	27	0	1	1	1		P
Þólfr	m	1	0	392	0	1	1	1	N	N
Þóra	f	1	0	51	1	2	2	2		P
Þóraldi	m	1	0	73	1	3	3	3	N	N
Þóraldr	m	1	0	345	23	3	3	3	N	N
Þorbergr	m	1	0	50	23	1	1	1		I
Þorbjǫrg	f	1	0	80	39	1	1	1		I
Þorbjǫrn	m	1	0	259	16	3	3	3		N
Þórðr	m	1	0	351	17	3	4	4		N
Þorfinnr	m	1	0	124	68	2	2	2		I
Þorgarðr	m	1	0	72	0	1	1	1	N	N
Þorgeirr	m	1	0	251	18	1	1	1		N
Þorgils/Þorgísl	m	1	0	383	21	5	5	5		N
Þorgrímr	m	1	0	273	98	1	1	1		I
Þorgunna	f	1	0	13	0	1	1	1		P
Þórhallr	m	1	0	0	22	2	2	2		I
Þóri	m	1	0			1	1	1		
Þórir	m	1	0	255	4	9	9	9		N
Þorkatla	f	1	0	1	2	2	2	2		P
Þorkell	m	1	0	284	21	5	5	5		N
Þorlákr	m	1	0	251	73	1	1	1		I
Þorleifr	m	1	0	509	66	1	1	1		P
Þormóðr	m	1	0	425	62	2	2	2		P
Þórr	m	0	0	17	0	3	3	2	M	P
Þorsteinn	m	1	0	339	30	6	6	6		N
Þorvaldr	m	1	0	43	36	1	1	1		I
Þorvarðr	m	1	0	75	46	1	1	1		I
Þorviðr	m	1	0	24	2	1	1	1		P
Þúfa	f	1	1	0	0	1	1	1		

Table 78. List of all idionyms in IDIONYM, sorted alphabetically (C.28), and the relevant calculations of percentages, χ^2-test-results and quartile. Percentages for the Bryggen corpus are calculated on insnidnoin*, tokens without possible invocations.*

Normalised	DI/5978 * 100	DN/35074 * 100	B/409 * 100	Quartile DI	Quartile DN	DI/6640 * 100	DN/20000 * 100	p-value DI/DN	p-value DN/Bryggen	p-value DI/Bryggen
Abed-Nego			0.0000							
Agi	0.0000	0.0057	0.2445		1	0.0000	0.0100	1.0000000000	0.0661933800	0.0349965000
Agnbjǫrg			0.2445						0.0649935000	0.0114988500
Alfvardr			0.2445						0.0638936100	0.0108989100
Amor			0.0000							
Ámundi	0.1840	0.0656	0.4890	2	1	0.1657	0.1150	0.0061993800	0.1998800100	0.0315968400
Án(n)	0.0000	0.0713	0.4890		2	0.0000	0.1250	0.0401959800	0.0044995500	0.0409959000
Andreas/Andrés	0.5186	0.5189	0.0000	3	3	0.4669	0.9100	1.0000000000	0.2641735800	0.1771822800
Áni	0.0000	0.0029	0.7335		1	0.0000	0.0050	1.0000000000	0.0002999700	0.0000999900
Anna	0.1338	0.0228	0.2445	1	1	0.1205	0.0400	0.0007999200	1.0000000000	0.0981901800
Anne			0.7335						0.0002999700	0.0000999900
Ari	3.3958	0.0855	0.4890	4	2	3.0572	0.1500	0.0000999900	0.0024997500	0.0540945900
Arnbjǫrg	0.0000	0.1369	0.2445		2	0.0000	0.2400	0.0081991800	0.0651934800	1.0000000000
Arnbjǫrn	1.3884	0.8468	0.2445	4	3	1.2500	1.4850	0.0000999900	0.0665933400	0.2773722600
Arnfinnr	1.1375	1.0150	0.2445	4	4	1.0241	1.7800	0.4048595100	0.1298870100	0.1407859200
Arni	0.6858	0.2537	3.1785	3	2	0.6175	0.4450	0.0000999900	0.0000999900	0.0000999900
Arnviðr	0.0836	0.2423	0.2445	1	2	0.0753	0.4250	0.0142985700	0.3334666500	1.0000000000
Ása	0.3346	0.7384	0.7335	2	3	0.3012	1.2950	0.0006999300	0.1866813300	1.0000000000
Ásbjǫrg	0.0000	0.0485	0.2445		1	0.0000	0.0850	0.1639836000	0.0679932000	0.1880811900
Ásgeirr	0.5353	0.3478	0.2445	3	2	0.4819	0.6100	0.0297970200	0.5263473700	1.0000000000
Ásgrímr	2.8270	0.1312	0.2445	4	2	2.5452	0.2300	0.0000999900	0.0016998300	1.0000000000
Áslákr	0.3011	2.7684	0.2445	2	4	0.2711	4.8550	0.0000999900	1.0000000000	0.0041995800
Ásmundr	1.5724	1.4085	0.2445	4	4	1.4157	2.4700	0.3479652000	0.0298970100	0.0483951600
Auðmundr			0.2445						0.0652934700	0.0124987500
Auðr	0.0000	0.0000	0.4890			0.0000	0.0000		0.0040995900	0.0002999700
Auðun	1.8401	2.4349	0.2445	4	4	1.6566	4.2700	0.0064993500	0.0143985600	0.0059994000
Bárðr	0.2007	0.7470	0.4890	2	3	0.1807	1.3100	0.0000999900	0.2311768800	0.6103389700
Benedikt	2.4088	1.3429	0.7335	4	4	2.1687	2.3550	0.0000999900	0.0397960200	0.3797620200
Benedikta	0.0000	0.0029	0.2445		1	0.0000	0.0050	1.0000000000	0.0623937600	0.0266973300
Bergsveinn	0.0335	0.2766	0.2445	1	2	0.0301	0.4850	0.0008999100	0.1871812800	1.0000000000
Bergþóra	0.0000	0.0000	0.2445			0.0000	0.0000		0.0655934400	0.0113988600
Bergþórr	1.5222	0.7384	0.4890	4	3	1.3705	1.2950	0.0000999900	0.1298870100	0.6083391700
Birgir	0.1004	0.4391	0.2445	1	3	0.0904	0.7700	0.0000999900	0.3683631600	0.7237276300
Bjarni/Biarni	0.1171	0.2537	0.4890	1	2	0.1054	0.4450	0.0573942600	0.1104889500	0.6339366100
Bjǫrn/Biǫrn	0.6189	0.7955	0.2445	3	3	0.5572	1.3950	0.1735826400	0.5066493400	0.2708729100
Bóthildr	0.0000	0.0656	0.2445		1	0.0000	0.1150	0.0682931700	0.0691930800	0.2473752600
Bótleifr			0.2445						0.0683931600	0.0105989400
Bótolfr	0.2509	1.2545	0.2445	2	4	0.2259	2.2000	0.0000999900	1.0000000000	0.0715928400
Brandr	0.5353	0.2851	0.2445	3	2	0.4819	0.5000	0.0032996700	0.5139486100	1.0000000000
Bubba			0.2445						0.0643935600	0.0129987000
Búi	0.1004	0.0086	0.2445	1	1	0.0904	0.0150	0.0008999100	0.3766623300	0.0452954700

Table 78. Alphabetical list of all idionyms in IDIONYM *and the relevant calculations of percentages, χ^2-test-results and quartile. Percentages for the Bryggen corpus are calculated on* insnidnoin, *tokens without possible invocations.*

Normalised	DI/5978 * 100	DN/35074 * 100	B/409 * 100	Quartile DI	Quartile DN	DI/6640 * 100	DN/20000 * 100	p-value DI/DN	p-value DN/Bryggen	p-value DI/Bryggen
Búr-Almarr			0.2445						0.0631936800	0.0115988400
Christus			0.0000							
Constantinus			0.0000							
Didrik	0.2007	0.0542	0.2445	2	1	0.1807	0.0950	0.0005999400	1.0000000000	0.2089791000
Dionysius			0.0000							
Egill	2.0575	0.3792	0.2445	4	2	1.8524	0.6650	0.0000999900	0.0103989600	0.7515248500
Einarr	0.2175	0.3621	1.2225	2	2	0.1958	0.6350	0.0939906000	0.0047995200	0.0193980600
Eindriði	1.1375	0.6900	1.4670	4	3	1.0241	1.2100	0.0007999200	0.6258374200	0.0738926100
Einri			0.2445						0.0621937800	0.0115988400
Eiríkr	0.6691	1.3229	2.6895	3	4	0.6024	2.3200	0.0001999800	0.0002999700	0.0317968200
Eldjarn/Eldiárn	0.2007	0.0000	0.2445	2		0.1807	0.0000	0.0000999900	1.0000000000	0.0095990400
Elisabet(h)	0.0167	0.0998	0.0000	1	2	0.0151	0.1750	0.0525947400	1.0000000000	1.0000000000
Erlendr	3.1449	2.0899	1.4670	4	4	2.8313	3.6650	0.0000999900	0.0694930500	0.4828517100
Erlingr	0.8197	4.0913	0.4890	3	4	0.7380	7.1750	0.0000999900	0.5832416800	0.0005999400
Eygísl/Eygils	0.0000	0.0228	0.2445		1	0.0000	0.0400	0.3829617000	0.0645935400	0.0952904700
Eyjolfr/Eyiólfr	0.9368	0.3906	0.4890	3	3	0.8434	0.6850	0.0000999900	0.4376562300	1.0000000000
Eysteinn	0.0167	0.8810	0.7335	1	4	0.0151	1.5450	0.0000999900	0.0007999200	0.8056194400
Eyvindr	0.1840	1.8333	0.2445	2	4	0.1657	3.2150	0.0000999900	1.0000000000	0.0231976800
Finnr	1.5557	0.9095	1.2225	4	4	1.4006	1.5950	0.0000999900	0.6880312000	0.6013398700
Fólkvarðr	0.0000	0.1369	0.2445		2	0.0000	0.2400	0.0079992000	0.0646935300	1.0000000000
Gabriel	0.0000	0.0171	0.0000		1	0.0000	0.0300	0.5980402000		1.0000000000
Gísl	0.7695	0.0114	0.2445	3	1	0.6928	0.0200	0.0000999900	0.3600639900	0.0576942300
Glúmr	0.0836	0.0086	0.2445	1	1	0.0753	0.0150	0.0017998200	0.3316668300	0.0461953800
Grímnir	0.0000	0.0000	0.0000			0.0000	0.0000			
Grímr	0.2676	0.4676	0.7335	2	3	0.2410	0.8200	0.0336966300	0.1167883200	0.4488551100
Guðmundr	1.0371	1.0749	0.7335	4	4	0.9337	1.8850	0.8432156800	0.6290371000	0.6299370100
Guðríðr	1.0371	0.5930	0.2445	4	3	0.9337	1.0400	0.0002999700	0.1278872100	0.5308469200
Guðrún	0.4015	0.7641	0.2445	2	3	0.3614	1.3400	0.0021997800	0.7340266000	0.2675732400
Guðsteinn	0.0000	0.0029	0.2445		1	0.0000	0.0050	1.0000000000	0.0654934500	0.0226977300
Guðþormr	1.4052	1.0350	0.2445	4	4	1.2651	1.8150	0.0127987200	0.0671932800	0.1429857000
Gunna	0.0000	0.0684	0.2445		2	0.0000	0.1200	0.0702929700	0.0595940400	0.2513748600
Gunnarr	0.2342	0.4419	3.1785	2	3	0.2108	0.7750	0.0194980500	0.0000999900	0.0000999900
Gunnhildr	0.2844	0.5246	0.2445	2	3	0.2560	0.9200	0.0135986400	1.0000000000	0.5437456300
Gunnsteinn	0.1506	0.0029	0.2445	2	1	0.1355	0.0050	0.0000999900	1.0000000000	0.0229977000
Gusir	0.0000	0.0000	0.2445			0.0000	0.0000		0.0617938200	0.0138986100
Gussir			0.2445						0.0645935400	0.0137986200
Gyða	0.0836	0.1369	0.4890	1	2	0.0753	0.2400	0.3347665200	0.0715928400	0.1181881800
Gyrðir			0.2445						0.0639936000	0.0119988000
Gyrðr	0.0836	0.9409	0.2445	1	4	0.0753	1.6500	0.0000999900	0.3346665300	0.1920807900
Gyrid			0.2445						0.0573942600	0.0105989400
Hafdjarfr	0.0000	0.0000	0.2445			0.0000	0.0000		0.0660933900	0.0114988500
Hafgrímr	0.0167	0.0000	0.2445	1		0.0151	0.0000	0.1484851500	0.1293870600	0.0115988400

Table 78. *Alphabetical list of all idionyms in* IDIONYM *and the relevant calculations of percentages, χ^2-test-results and quartile. Percentages for the Bryggen corpus are calculated on* insnidnoin, *tokens without possible invocations.*

Normalised	DI/5978 * 100	DN/35074 * 100	B/409 * 100	Quartile DI	Quartile DN	DI/6640 * 100	DN/20000 * 100	p-value DI/DN	p-value DN/Bryggen	p-value DI/Bryggen
Hákon	2.1914	0.5987	0.2445	4	3	1.9729	1.0500	0.0000999900	0.0092990700	0.5320468000
Hálfdan	0.6858	0.0941	0.2445	3	2	0.6175	0.1650	0.0000999900	0.3765623400	0.3176682300
Hallbjǫrg	0.0167	0.0114	0.2445	1	1	0.0151	0.0200	1.0000000000	0.1265873400	0.0554944500
Halldórr	0.1004	1.0407	0.4890	1	4	0.0904	1.8250	0.0000999900	0.0908909100	0.3278672100
Hallgísl/Hallgils	0.0000	0.0000	0.2445			0.0000	0.0000		0.0665933400	0.0110988900
Halli	0.2175	0.3450	0.4890	2	2	0.1958	0.6050	0.1421857800	0.2458754100	0.6556344400
Hallkatla	0.0000	0.0086	0.4890		1	0.0000	0.0150	1.0000000000	0.0038996100	0.0020997900
Hallkell	0.5353	0.4391	0.2445	3	3	0.4819	0.7700	0.3444655500	0.5161483900	0.7315268500
Hallsteinn	0.7862	1.0064	0.2445	3	4	0.7078	1.7650	0.1118888100	0.2614738500	0.1292870700
Hallvarðr	0.2342	2.1897	0.9780	2	4	0.2108	3.8400	0.0000999900	0.0267973200	0.1178882100
Haraldr	0.4015	1.7107	0.4890	2	4	0.3614	3.0000	0.0000999900	1.0000000000	0.0712928700
Hávarðr	0.3847	2.4291	0.2445	2	4	0.3464	4.2600	0.0000999900	0.7384261600	0.0054994500
Hávarr	0.0167	0.0000	0.2445	1		0.0151	0.0000	0.1437856200	0.1250874900	0.0128987100
Heðinn	0.0502	0.0770	0.2445	1	2	0.0452	0.1350	0.6074392600	0.2310768900	0.2804719500
Heinrekr	0.5018	0.7441	0.7335	3	3	0.4518	1.3050	0.0441955800	0.7288271200	1.0000000000
Helga	0.0669	0.3963	0.2445	1	3	0.0602	0.6950	0.0001999800	0.2823717600	0.7378262200
Helgi	0.1338	0.8069	0.7335	1	3	0.1205	1.4150	0.0000999900	0.0334966500	1.0000000000
Herikr			0.2445						0.0642935700	0.0111988800
Hermaðr			0.7335						0.0002999700	0.0000999900
Hermann	0.2509	0.1711	0.7335	2	2	0.2259	0.3000	0.1869813000	0.1082891700	0.0361963800
Holmr	0.0000	0.0741	0.2445		2	0.0000	0.1300	0.0427957200	0.0630936900	0.2674732500
Hrólfr (Rolfr)	0.4015	1.2260	0.2445	2	4	0.3614	2.1500	0.0000999900	0.7212278800	0.1034896500
Illugi	2.4590	0.0000	0.2445	4		2.2139	0.0000	0.0000999900	0.0054994500	0.0117988200
Ími	0.0836	0.0000	0.2445	1		0.0753	0.0000	0.0000999900	0.3284671500	0.0112988700
Inga	0.0669	0.0912	0.2445	1	2	0.0602	0.1600	0.6468353200	0.2792720700	0.3165683400
Ingibjǫrg/Ingibiǫrg	1.8066	1.5310	0.7335	4	4	1.6265	2.6850	0.1245875400	0.1177882200	0.2248775100
Ingimundr	2.5761	0.4704	0.2445	4	3	2.3193	0.8250	0.0000999900	0.0041995800	0.7262273800
Ingiríðr	0.5018	0.7156	0.2445	3	3	0.4518	1.2550	0.0693930600	0.7140286000	0.3815618400
Ingjaldr/Ingialdr	0.5186	0.5560	0.2445	3	3	0.4669	0.9750	0.7809219100	0.5338466200	0.5259474100
Ió(h)an/Jó(h)an	0.4182	0.3849	1.4670	3	3	0.3765	0.6750	0.7366263400	0.0000999900	0.0000999900
Ióðgeirr/Jóðgeirr	0.0000	0.0228	0.2445		1	0.0000	0.0400	0.3834616500	0.0633936600	0.0997900200
Iógeirr/Jógeirr	0.0000	0.0171	0.2445		1	0.0000	0.0300	0.5976402400	0.0654934500	0.0808919100
Ívarr	0.1506	0.8069	0.9780	2	3	0.1355	1.4150	0.0000999900	0.0076992300	0.7727227300
Jesus			0.0000							
Johannes			0.0000							
Jón			2.2005							
Jórunn/Iórunn	0.2007	0.4448	0.2445	2	3	0.1807	0.7800	0.0094990500	1.0000000000	0.7280272000
Karl	0.4182	0.8781	0.2445	3	3	0.3765	1.5400	0.0003999600	0.7259274100	0.1940805900
Kárr	0.5186	0.0257	0.2445	3	1	0.4669	0.0450	0.0000999900	0.5322467800	0.1098890100
Kátr	0.0000	0.0057	0.2445		1	0.0000	0.0100	1.0000000000	0.0629937000	0.0330966900
Kattr			0.2445						0.0635936400	0.0123987600

Table 78. Alphabetical list of all idionyms in IDIONYM *and the relevant calculations of percentages, χ²-test-results and quartile. Percentages for the Bryggen corpus are calculated on* insnidnoin, *tokens without possible invocations.*

Normalised	DI/5978 * 100	DN/35074 * 100	B/409 * 100	Quartile DI	Quartile DN	DI/6640 * 100	DN/20000 * 100	p-value DI/DN	p-value DN/Bryggen	p-value DI/Bryggen
Klas			0.2445						0.0615938400	0.0121987800
Klémetr	0.5353	0.8810	0.0000	3	4	0.4819	1.5450	0.0065993400	0.1692830700	0.0547945200
Kolbeinn	2.8605	0.8126	0.9780	4	3	2.5753	1.4250	0.0000999900	0.0240975900	0.7719228100
Kolbjǫrn	0.0502	1.2545	0.4890	1	4	0.0452	2.2000	0.0000999900	0.0368963100	0.1816818300
Kormakr	0.0335	0.0057	0.0000	1	1	0.0301	0.0100	0.1028897100	1.0000000000	1.0000000000
Kǫttr	0.0000	0.0000	0.2445			0.0000	0.0000		0.0662933700	0.0117988200
Lafranz	0.0669	0.7755	0.2445	1	3	0.0602	1.3600	0.0000999900	0.2687731200	0.2631736800
Ljótr/Liotr	1.0204	0.1340	0.4890	3	2	0.9187	0.2350	0.0000999900	0.3237676200	0.1115888400
Loðinn	0.1840	0.7698	0.4890	2	3	0.1657	1.3500	0.0000999900	0.2069793000	0.5952404800
Lúcia	0.0000	0.0599	0.4890		1	0.0000	0.1050	0.0629937000	0.0033996600	0.0277972200
Lukas	0.0167	0.0029	0.0000	1	1	0.0151	0.0050	0.2682731700	1.0000000000	1.0000000000
Lunaney			0.2445						0.0654934500	0.0113988600
Magnús	0.4349	0.4562	0.2445	3	3	0.3916	0.8000	0.8395160500	0.7232276800	0.7301269900
Malchus			0.0000							
Margrét(a)	1.7732	1.6565	0.4890	4	4	1.5964	2.9050	0.5467453300	0.0677932200	0.0772922700
María	0.0000	0.0228	0.4890		1	0.0000	0.0400	0.3747625200	0.0042995700	0.0063993600
Markús	1.5557	0.1283	0.0000	4	2	1.4006	0.2250	0.0000999900	0.0151984800	0.6858314200
Markvarðr	0.0000	0.1140	0.2445		2	0.0000	0.2000	0.0104989500	0.0671932800	0.3829617000
Martinianus			0.0000							
Mat(t)heus	0.3346	0.0086	0.0000	2	1	0.3012	0.0150	0.0000999900	0.3968603100	1.0000000000
Maximianus			0.0000							
Mesak			0.0000							
Michael/Mikiáll	0.3847	0.4448	0.0000	2	3	0.3464	0.7800	0.5319468100	0.4037596200	0.2642735700
Munán	0.0000	0.0855	0.2445		2	0.0000	0.1500	0.0322967700	0.0655934400	0.3078692100
Myttar			0.2445						0.0633936600	0.0134986500
Narfi	3.4125	1.1861	0.2445	4	4	3.0723	2.0800	0.0000999900	0.0003999600	0.1050894900
Nikulás/Nikolás	0.7360	1.4455	0.4890	3	4	0.6627	2.5350	0.0000999900	0.7702229800	0.1363863600
Oddr	1.5390	0.9437	0.2445	4	4	1.3855	1.6550	0.0000999900	0.0489951000	0.1974802500
Óðinn	0.0000	0.0228	0.0000		1	0.0000	0.0400	0.3834616500		1.0000000000
Ǫgmundr	0.7193	2.1725	0.7335	3	4	0.6476	3.8100	0.0000999900	1.0000000000	0.0471952800
Ólafr	0.5855	1.0121	2.2005	3	4	0.5271	1.7750	0.0011998800	0.0014998500	0.0271972800
Ǫlrekr	0.0000	0.0086	0.2445		1	0.0000	0.0150	1.0000000000	0.0607939200	0.0474952500
Ǫlvir/Ølvir	0.1004	0.3649	0.2445	1	2	0.0904	0.6400	0.0015998400	0.3778622100	1.0000000000
Ǫnundr	0.5186	2.1754	0.2445	3	4	0.4669	3.8150	0.0000999900	0.5220478000	0.0068993100
Ormr	0.1171	0.1910	0.4890	1	2	0.1054	0.3350	0.2492750700	0.1073892600	0.1890810900
Ormríkr			0.2445						0.0652934700	0.0101989800
Óttarr	0.3011	0.4476	0.2445	2	3	0.2711	0.7850	0.1273872600	1.0000000000	0.7362263800
Ótto	0.0335	0.2395	0.2445	1	2	0.0301	0.4200	0.0017998200	0.1776822300	1.0000000000
Pálni	0.0000	0.0599	0.2445		1	0.0000	0.1050	0.0623937600	0.0600939900	0.2261773800
Pétr	0.2844	1.0492	0.2445	2	4	0.2560	1.8400	0.0000999900	1.0000000000	0.1403859600
Philomena			0.0000							
Poppe			0.2445						0.0674932500	0.0119988000

Table 78. Alphabetical list of all idionyms in IDIONYM and the relevant calculations of percentages, χ^2-test-results and quartile. Percentages for the Bryggen corpus are calculated on insnidnoin, *tokens without possible invocations.*

Normalised	DI/5978 * 100	DN/35074 * 100	B/409 * 100	Quartile DI	Quartile DN	DI/6640 * 100	DN/20000 * 100	p-value DI/DN	p-value DN/Bryggen	p-value DI/Bryggen
Ragnarr	0.2342	0.0171	0.2445	2	1	0.2108	0.0300	0.0000999900	1.0000000000	0.0763923600
Ran	0.0000	0.0000	0.0000			0.0000	0.0000			
Rannveig	0.3513	0.6016	0.7335	2	3	0.3163	1.0550	0.0198980100	0.4039596000	0.7430257000
Raphael			0.0000							
Raumr	0.0000	0.0000	0.0000			0.0000	0.0000			
Reiðarr			0.2445						0.0655934400	0.0122987700
Rúnolfr	2.8605	0.0884	0.2445	4	2	2.5753	0.1550	0.0000999900	0.0019998000	0.3035696400
Sadrak			0.0000							
Sámr	0.0000	0.0029	0.7335		1	0.0000	0.0050	1.0000000000	0.0002999700	0.0000999900
Samson	0.0000	0.0371	0.2445		1	0.0000	0.0650	0.2361763800	0.0631936800	0.1515848400
Sægunni			0.2445						0.0681931800	0.0114988500
Serapion			0.0000							
Sessi			0.2445						0.0650934900	0.0103989600
Sigbaldr			0.2445						0.0664933500	0.0117988200
Siggi	0.0000	0.0314	0.2445		1	0.0000	0.0550	0.2435756400	0.0638936100	0.1222877700
Sighvatr	1.6059	0.5959	0.2445	4	3	1.4458	1.0450	0.0000999900	0.0306969300	0.5345465500
Sigolfr/Sigólfr	0.0000	0.0029	0.2445		1	0.0000	0.0050	1.0000000000	0.0651934800	0.0214978500
Sigríðr	1.3717	1.4484	1.2225	4	4	1.2349	2.5400	0.6767323300	0.8409159100	0.8358164200
Sigurðr	1.3717	2.8967	4.6455	4	4	1.2349	5.0800	0.0000999900	0.0000999900	0.0554944500
Sigvaldi			0.2445						0.0612938700	0.0132986700
Sigvaldr	0.0000	0.0770	0.4890		2	0.0000	0.1350	0.0513948600	0.0042995700	0.0451954800
Símon	0.7862	1.3201	0.7335	3	4	0.7078	2.3150	0.0009999000	1.0000000000	0.3893610600
Skeggi	0.9702	0.0627	0.2445	3	1	0.8735	0.1100	0.0000999900	0.1849815000	0.2327767200
Smiðr	0.0502	0.2766	0.2445	1	2	0.0452	0.4850	0.0012998700	0.2315768400	1.0000000000
Sǫlveig	0.8197	0.0314	0.2445	3	1	0.7380	0.0550	0.0000999900	0.2603739600	0.1271872800
Sørkviðr			0.2445						0.0618938100	0.0097990200
Sørkvir	0.1171	0.1540	0.2445	1	2	0.1054	0.2700	0.5960404000	1.0000000000	1.0000000000
Steinarr	0.0502	1.1604	0.2445	1	4	0.0452	2.0350	0.0000999900	0.2329767000	0.1023897600
Styrkárr	0.2007	0.1369	0.2445	2	2	0.1807	0.2400	0.2707729200	1.0000000000	1.0000000000
Sveinn	0.3346	0.5503	0.7335	2	3	0.3012	0.9650	0.0381961800	0.1789821000	0.7333266700
Sverðolfr			0.2445						0.0655934400	0.0115988400
Tast			0.2445						0.0632936700	0.0122987700
Tereus			0.0000							
Thomás	1.9404	0.5731	0.0000	4	3	1.7470	1.0050	0.0000999900	0.0066993300	0.1857814200
Tobias			0.0000							
Tonna			0.2445						0.0659934000	0.0133986600
Týhvatr/Tivatr	0.0000	0.0342	0.2445		1	0.0000	0.0600	0.2405759400	0.0601939800	0.1396860300
Týr	0.0000	0.0000	0.0000			0.0000	0.0000			
Únás(s)	0.0000	0.0513	0.2445		1	0.0000	0.0900	0.0940905900	0.0640935900	0.1985801400
Vébrandr	0.0167	0.0314	0.2445	1	1	0.0151	0.0550	0.7037296300	0.1189881000	0.1372862700
Vémundr	0.1338	0.0399	0.2445	1	1	0.1205	0.0700	0.0099990000	1.0000000000	0.1579842000
Vígdís	0.4349	0.0114	0.2445	3	1	0.3916	0.0200	0.0000999900	0.7302269800	0.0534946500

Table 78. Alphabetical list of all idionyms in IDIONYM *and the relevant calculations of percentages,* χ^2*-test-results and quartile. Percentages for the Bryggen corpus are calculated on* insnidnoin*, tokens without possible invocations.*

Normalised	DI/5978 * 100	DN/35074 * 100	B/409 * 100	Quartile DI	Quartile DN	DI/6640 * 100	DN/20000 * 100	p-value DI/DN	p-value DN/Bryggen	p-value DI/Bryggen
Vígi	0.0000	0.0228	0.7335		1	0.0000	0.0400	0.3747625200	0.0004999500	0.0001999800
Vilhelmus/-Vilhiálmr	1.2211	0.6244	0.2445	4	3	1.0994	1.0950	0.0000999900	0.0831916800	0.3854614500
Yggjar/Yggr	0.0000	0.0000	0.0000			0.0000	0.0000			
Yngvildr	1.4721	0.0000	0.2445	4		1.3253	0.0000	0.0000999900	0.0407959200	0.0120987900
Þiðrikr			0.2445						0.0651934800	0.0108989100
Þjóðarr	0.0000	0.0000	0.2445			0.0000	0.0000		0.0627937200	0.0113988600
Þjóðgeir-r/Þióðgeirr	0.0000	0.0770	0.2445		2	0.0000	0.1350	0.0486951300	0.0658934100	0.2892710700
Þólfr	0.0000	1.1176	0.2445		4	0.0000	1.9600	0.0000999900	0.0597940200	0.1483851600
Þóra	0.0167	0.1454	0.4890	1	2	0.0151	0.2550	0.0103989600	0.0112988700	0.1217878200
Þóraldi	0.0167	0.2081	0.7335	1	2	0.0151	0.3650	0.0009999000	0.0007999200	0.0564943500
Þóraldr	0.3847	0.9836	0.7335	2	4	0.3464	1.7250	0.0000999900	0.4029597000	0.6415358500
Þorbergr	0.3847	0.1426	0.2445	2	2	0.3464	0.2500	0.0001999800	0.7330267000	1.0000000000
Þorbjǫrg	0.6524	0.2281	0.2445	3	2	0.5873	0.4000	0.0000999900	0.3789621000	1.0000000000
Þorbjǫrn	0.2676	0.7384	0.7335	2	3	0.2410	1.2950	0.0001999800	0.1188881100	1.0000000000
Þórðr	0.2844	1.0007	0.9780	2	4	0.2560	1.7550	0.0000999900	0.0451954800	1.0000000000
Þorfinnr	1.1375	0.3535	0.4890	4	2	1.0241	0.6200	0.0000999900	0.3207679200	0.6534346600
Þorgarðr	0.0000	0.2053	0.2445		2	0.0000	0.3600	0.0012998700	0.0633936600	1.0000000000
Þorgeirr	0.3011	0.7156	0.2445	2	3	0.2711	1.2550	0.0002999700	1.0000000000	0.3784621500
Þorgils/Þorgísl	0.3513	1.0920	1.2225	2	4	0.3163	1.9150	0.0000999900	0.0233976600	0.8146185400
Þorgrímr	1.6393	0.7784	0.2445	4	3	1.4759	1.3650	0.0000999900	0.0344965500	0.2705729400
Þorgunna	0.0000	0.0371	0.2445		1	0.0000	0.0650	0.2393760600	0.0590940900	0.1502849700
Þórhallr	0.3680	0.0000	0.4890	2		0.3313	0.0000	0.0000999900	1.0000000000	0.0004999500
Þóri			0.2445						0.0652934700	0.0101989800
Þórir	0.0669	0.7270	2.2005	1	3	0.0602	1.2750	0.0000999900	0.0000999900	0.0034996500
Þorkatla	0.0335	0.0029	0.4890	1	1	0.0301	0.0050	0.0593940600	0.0223977600	0.0004999500
Þorkell	0.3513	0.8097	1.2225	2	3	0.3163	1.4200	0.0003999600	0.0228977100	0.4010598900
Þorlákr	1.2211	0.7156	0.2445	4	3	1.0994	1.2550	0.0001999800	0.0943905600	0.3878612100
Þorleifr	1.1040	1.4512	0.2445	4	4	0.9940	2.5450	0.0453954600	0.1252874700	0.0491950800
Þormóðr	1.0371	1.2117	0.4890	4	4	0.9337	2.1250	0.2771722800	0.3315668400	0.2478752100
Þórr	0.0000	0.0485	0.4890		1	0.0000	0.0850	0.1607839200	0.0043995600	0.0192980700
Þorsteinn	0.5018	0.9665	1.4670	3	4	0.4518	1.6950	0.0001999800	0.0259974000	0.3018698100
Þorvaldr	0.6022	0.1226	0.2445	3	2	0.5422	0.2150	0.0000999900	0.5122487800	1.0000000000
Þorvarðr	0.7695	0.2138	0.2445	3	2	0.6928	0.3750	0.0000999900	0.3727627200	1.0000000000
Þorviðr	0.0335	0.0684	0.2445	1	2	0.0301	0.1200	0.4095590400	0.1883811600	0.2444755500
Þúfa	0.0000	0.0000	0.2445			0.0000	0.0000		0.0639936000	0.0108989100

C Code documentation

For chapters involving DB operations, the code referred to in the chapters is documented using the LaTeχ listings package. This code does not copypaste well into GUI; the raw code can be obtained by contacting the author via e.m.magin@khm.uio.no.

Query C.1. *Query to create TAKERUN in an existing installation of MySQL/MariaDB*

```
CREATE DATABASE takerun
CHARACTER SET utf8mb4
COLLATE utf8mb4_general_ci;
```

Query C.2. *Model query for table creation*

```
CREATE TABLE inscriptions (
insid varchar(8) NOT NULL
   PRIMARY KEY,
altnr varchar(15),
alttil int(9),
bno int(6),
bnoin varchar(7),
niyr varchar(7)
);
```

The values in this query are taken from Table 7; the resulting table will therefore resemble INSCRIPTION. Using the values for the other tables creates these instead.

Query C.3. *Retrieving the count of individual occurrences for each idionym from IDIONYM*

```
SELECT normalised,dn,di
FROM idionym;
```

The query can be modified to only show the count for one particular idionym, only idionyms, only bynames, etc. by adding a WHERE-clause.

Query C.4. *Retrieving a count of how many inscriptions from Bryggen contain names from PATTERNING*

```
SELECT COUNT(DISTINCT
    transliteration.insid)
FROM transliteration LEFT
    JOIN patterning
ON transliteration.tlitid
   = patterning.tlitid
WHERE patterning.names=1;
```

COUNT() is an SQL function which counts tokens. DISTINCT specifies that only different tokens should be returned, i.e. if *ins12* occurs 5 times, it still only appears once in the result set. Since only distinct*insids* are counted, DISTINCT must be inside the brackets. Were it outside, the count would be at 743, e.g. there are 743 patterns where the name BOOL is set to 1.
For a list of *insids*, COUNT() has to be deleted.

Query C.5. Retrieving a data subset for manual or automatic counting of all idionym occurrences in the Bryggen corpus

```
SELECT transliteration.insid, transliteration.tlitid,
    transliteration.transliteration,
    transliteration.tlitsource, patterning.patid,
    patterning.own, patterning.latin, patterning.nonlexical,
    patterning.names, patterning.namesno,
    patterning.bynames, patterning.bynamesno,
    inscriptionnames.insnid, inscriptionnames.spelling,
    inscriptionnames.interlocutor,
    inscriptionnames.invocation, idionym.normalised
FROM
((((transliteration LEFT JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
LEFT JOIN sequences ON patterning.patid=sequences.patid)
LEFT JOIN inscriptionnames ON
    sequences.insnid=inscriptionnames.insnid)
LEFT JOIN namejoin ON
    inscriptionnames.insnid=namejoin.insnid)
LEFT JOIN idionym ON namejoin.idioid=idionym.idioid
WHERE patterning.names=1
ORDER BY transliteration.insid,
    transliteration.tlitsource, transliteration.tlitid,
    inscriptionnames.insnid;
```

Query C.6. Three queries nested into each other in order to retrieve the maximum number of tokens of single idionyms from the Bryggen corpus

```
SELECT normalised, MAX(countinsid), MAX(countinsnid)
FROM
(
SELECT normalised, tlitsource, COUNT(DISTINCT insid) AS
    countinsid, COUNT(DISTINCT insnid) AS countinsnid
FROM
(
SELECT DISTINCT transliteration.insid,
    transliteration.tlitsource, inscriptionnames.insnid,
    idionym.normalised
FROM
((((transliteration LEFT JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
LEFT JOIN sequences ON patterning.patid=sequences.patid)
LEFT JOIN inscriptionnames ON
    sequences.insnid=inscriptionnames.insnid)
```

```
LEFT JOIN namejoin ON
    inscriptionnames.insnid=namejoin.insnid)
LEFT JOIN idionym ON namejoin.idioid=idionym.idioid
WHERE patterning.names=1) AS inbetween
GROUP BY normalised,tlitsource) AS bergennos
GROUP BY normalised;
```

If the WHERE-clause in the query is replaced with “WHERE patterning.names=1 AND inscriptionnames.interlocutor=1 AND inscriptionnames.invocation=0”, only tokens not marked as *interlocutor* will be counted. *bergeninsid, bergeninsnid, noinvoinsid* and *noinvoinsnid* are updated by running an UPDATE-query using this nested query.

Query C.7. *Retrieving counts of various tokens from different columns in IDIONYM*

```
SELECT SUM([corpus])
FROM idionym;
```

CORPUS needs to be replaced by either “insnidnoin, bergeninsnid, di, dn”. An optional WHERE-clause can be added to count tokens with a country assignation: WHERE pred="[qualifier]", with the qualifier for example being “I, N, PS”.

Query C.8. *Creating the selection of idionyms upon which to run the χ^2-test from the database*

```
SELECT normalised, di, dn
FROM idionym
WHERE bergeninsid IS NOT
    NULL
AND (di <> 0 OR dn <> 0)
    ORDER BY normalised;
```

The columns *normalised, di, dn* are the only columns required for this task; the WHERE-clause limits the dataset to idionyms attested in the Bryggen corpus (bergeninsid IS NOT NULL) and those with a value of more than 0 in either *di* or *dn* (AND (di <> 0 OR dn <> 0)), by which mythological idionyms not in use as PNs in the diplomataria are excluded. Idionyms used as PNs in the diplomataria are included, though. ORDER BY sorts the resulting list alphabetically.

Query C.9. *Reading the exported csv-file into R*

```
ditodn <- read.csv("ditodn.csv", encoding="UTF-8")
```

Query C.10. *Compiling a complete list of idionyms*

```
ditodnnames <- ditodn[,1]
```

Query C.11. Traditional χ^2-test

```
chi.ditodn <-
    chisq.test(x=ditodn[,2:3],
    simulate.p.value=T,
   B=10000)
```

chi.ditodn is the traditional test giving an overall result, whereas the code following *ditodneachname* provides the results for each idionym.

Query C.12. χ^2-test for each single idionym

```
set.seed(1313)

ditodneachname <- matrix(NA, ncol=3,nrow=dim(ditodn)[1])
colnames(ditodneachname) <- c("observedChi2","df","p")
ditodneachname <- data.frame(ditodneachname)

for (i in 1:dim(ditodn)[1])
{
tab <- rbind(ditodn[i,2:3],colSums(ditodn[,2:3]))
chi <- chisq.test(tab,simulate.p.value=T,B=10000)
ditodneachname$observedChi2[i] <- chi$statistic
ditodneachname$p[i] <- chi$p.value
}
```

Query C.13. Adding idionym to respective row

```
rownames(ditodneachname) <- ditodnnames
```

Query C.14. Calculating number of idionyms with p<*.05*

```
table(ditodneachname$p <.05)
```

Query C.15. Calculating number of idionyms with p<*.01*

```
table(ditodneachname$p <.01)
```

Query C.16. Creating a list of idionyms with p<*.01*

```
ditodncat1 <- ditodneachname[ditodneachname$p <.01,]
```

Query C.17. Creating a list of idionyms with p>*.01*

```
ditodncat2 <- ditodneachname[ditodneachname$p >.01,]
```

Before the following two queries can be run, the results of the χ^2-test need to be imported into TAKERUN, for example by using an INSERT INTO-statement. It is preferable to import them into a separate table instead of adding them to IDIONYM, for example designated CHITABLE.

Query C.18. Querying for the idionyms in Category 1a and 1b

```
SELECT idionym.normalised, idionym.di/5978*100,
    idionym.dn/35074*100
FROM idionym
INNER JOIN chitable ON idionym.normalised =
    chitable.normalised
WHERE ((chitable.pditodn < 0.01) AND (idionym.di/5978 >
    idionym.dn/35074))
ORDER BY normalised;
```

If instead of >, < is used in "idionym.di/5978 > idionym.dn/35074", the query will return Category 1b.

Query C.19. Creating the data subsets dionly *and* dnonly *for export into R and subsequent calculations of mean, median, standard deviation, stem-and-leaf plot and quartiles*

```
SELECT normalised, [corpus]
FROM idionym
WHERE bergeninsid IS NOT
    NULL
AND [corpus] IS NOT NULL
    AND [corpus] <> 0
AND idionym = 1 AND byname
    = 0;
```

CORPUS needs to be replaced by "di" or "dn". The WHERE-clause excludes all idionyms not found in Bryggen and the corpus in question (bergeninsid IS NOT NULL AND di/dn IS NOT NULL), those with 0 occurrences in the respective corpus (di/dn <> 0) and those also identified as bynames (idionym = 1 AND byname = 0). Because AND is used, the result set needs to fulfill *all* conditions specified in the query. Idionyms not fulfilling one of the latter conditions belong to Category 3 or are not part of the dataset (cf. Section 5.7.4).

Query C.20. Calculating mean, median, standard deviation, stem-and-leaf plots and quartiles in R for dionly *and* dnonly

```
dnonly <- read.csv("dnonly.csv",encoding="UTF-8")
onlydn = dnonly$dn
mean(onlydn)
```

```
sd(onlydn)
median(onlydn)
stem(onlydn, scale = 6)
quantile(onlydn)
```

Replacing “dnonly” with “dionly” will return the required results for *DI*.
Alternatively running these queries will give the same results:

Query C.21. *Calculating the means for DN and DI in SQL*

```
SELECT AVG([corpus])
FROM idionym
WHERE bergeninsid IS NOT
    NULL AND [corpus] IS
    NOT NULL
AND [corpus] <> 0 AND
    idionym = 1
AND byname = 0;
```

CORPUS must be replaced with either “di” or “dn”. The AVG() function does this for any numeric column in a database. Mark that in both cases, the WHERE-clause limits the rows in the same way the former query for exporting the data did. They also return the exact same results.

Query C.22. *Calculating the median for idionyms in DN and DI in SQL; code by velcrow 2018*

```
SELECT AVG([corpus]) AS median_val
FROM (
SELECT [corpus], @rownum:=@rownum+1 AS rownumber,
    @total_rows:=@rownum
FROM idionym, (SELECT @rownum:=0) r
WHERE bergeninsid IS NOT NULL AND [corpus] IS NOT NULL
AND [corpus] <> 0 AND idionym = 1
AND byname = 0 ORDER BY [corpus]) AS dd
WHERE dd.rownumber IN ( FLOOR((@total_rows+1)/2),
    FLOOR((@total_rows+2)/2));
```

CORPUS must be replaced with “di” or “dn”.

Query C.23. *Query selecting all idionyms for the* χ^2*-test comparing Bryggen and DI/DN*

```
SELECT normalised, [corpus], insnidnoin
FROM idionym
WHERE (([corpus] = 0 OR [corpus] IS NULL OR [corpus] <> 0)
    AND insnidnoin <> 0)
OR ([corpus] <> 0 AND insnidnoin=0);
```

CORPUS must be replaced with “di” or “dn”. The column used to retrieve the count of tokens for Bryggen is *insnidnoin, inscription name id no invocation*. The numbers in this column are in turn based on C.6, which excludes every token that might be an invocation. Since the χ^2-test cannot work when several values show 0/NULL, these entries are excluded for the most part by the WHERE-clause. Because the dataset is retrieved using *insnidnoin,* both columns can actually show a count of 0. Viable combinations of the two column values are:

1. if CORPUS has zero tokens, insnidnoin cannot have 0 tokens
2. if CORPUS is set to NULL, insnidnoin cannot have 0 tokens
3. all entries where CORPUS and insnidnoin show a value other than 0
4. if insnidnoin is 0, CORPUS cannot have 0 tokens

```
[corpus] = 0 AND insnidnoin <> 0
[corpus] IS NULL AND insnidnoin <> 0
[corpus] <> 0 AND insnidnoin <> 0
[corpus] <> 0 AND insnidnoin = 0
```

Number 3 must be included because otherwise, all entries where CORPUS has values starting from 1 will be excluded. Some more checking is required after the dataset has been retrieved; NULL must be replaced by 0 so the test can properly work, and the correct values for *Ió(h)an/Jó(h)an* must be entered manually, cf. 5.7.1.

Query C.24. *Running a χ^2-test to compare frequencies of idionyms in DI or DN and Bryggen*

```
bergendi <- read.csv("bergendi.csv",encoding="UTF-8")
bdinames <- bergendi[,1]
set.seed(1313)

chi.bergendi <-
    chisq.test(x=bergendi[,2:3],simulate.p.value=T,B=10000)

bergendichi <- matrix(NA,ncol=3,nrow=dim(bergendi)[1])
colnames(bergendichi) <- c("observedChi2","df","p")
bergendichi <- data.frame(bergendichi)

for (i in 1:dim(bergendi)[1])
{
tab <- rbind(bergendi[i,2:3],colSums(bergendi[,2:3]))
chi <- chisq.test(tab,simulate.p.value=T,B=10000)
bergendichi$observedChi2[i] <- chi$statistic
bergendichi$p[i] <- chi$p.value
}

rownames(bergendichi) <- bdinames
```

Replacing "bergendi" with "bergendn" runs the same test for the other dataset.

Query C.25. Creating VIEW bignametable *from IDIONYM and CHITABLE*

```
CREATE VIEW bignametable AS
SELECT idioside.*,
    chitable.pditodn,
    chitable.pbergendn,
    chitable.pbergendi
FROM
(SELECT normalised,
    gender, idionym,
    byname, dn, di,
    bergeninsid,
    bergeninsnid,
    insnidnoin, di/5978*100
    AS iceperc,
    dn/35074*100 AS
    norperc,
    insnidnoin/409*100 AS
    berperc,
    lindlocalisation,
    pred,quarti, quartn,
    di/6640*100 AS diperc,
    dn/20000*100 AS dnperc
FROM idionym) AS idioside
INNER JOIN chitable ON
    idioside.normalised =
    chitable.normalised
ORDER BY normalised;
```

To simplify working with TAKERUN and also to decrease query time, VIEWs can be created, which are

> [...] virtual table[s] based on the result-set of an SQL statement. A view contains rows and columns, just like a real table. The fields in a view are fields from one or more real tables in the database (w3schools 2020).

VIEWs are treated like proper tables, however the data contained in them is made up of fields and columns from different tables – in this case a combination of data from IDIONYM and CHITABLE. Since the data is already collected in one single VIEW, queries can be run faster, as the RDBMS does not need to retrieve it from several different tables. All regular SQL-statements can be used on VIEWs just like they are used on tables. Using these subsets of data instead of long-winded queries can also reduce confusion and errors in linking tables together.

Query C.26. Retrieving the numbers for several tables in Section 5.7.1 and Section 5.7.2

```
SELECT normalised, [columns]
FROM bignametable
WHERE [p-value-column] < .01;
```

COLUMNS can be replaced by any and all combinations of "pred, iceperc, norperc, berperc, quarti, quartn, insnidnoin, di, dn", depending on what particular subset is desired at the time. [p-value-column] needs to be replaced by "pbergendi" or "pbergendn". < .01 will give all idionyms for which the test finds a statistically significant difference between the two corpora in question, > .01 all those where there is none. Further possible modifications include for example: AND iceperc > berperc (only idionyms where *DI* 1857-1952 has the higher relative frequency); AND pred="N" (only idionyms appearing predominantly in *DN* 1848-1920) and various others that are too numerous to be listed here. This basic query and its multiple variations was the most important tool for analysing the results of the various tests and comparisons in this section.

Query C.27. *Selecting the idionyms in Category 3 from* IDIONYM

```
SELECT normalised
FROM
(SELECT * FROM idionym
WHERE idionym = 1 AND
    byname = 0) AS inbetween
WHERE bergeninsid IS NOT
    NULL
AND ((dn IS NULL AND di IS
    NULL) OR (dn=0 AND
    di=0))
ORDER BY normalised;
```

The subquery first defines a data subset of tokens identified as idionyms (idionym = 1) and at the same time excludes tokens which can be both idionym and byname (AND byname = 0). The main query then eliminates tokens not attested in the Bryggen corpus (bergeninsid IS NOT NULL) and defines that the remaining tokens should either have a NULL value or a 0 in the *dn*- and *di*-columns (AND ((dn IS NULL AND di IS NULL) OR (dn=0 AND di=0))).

Query C.28. *The queries Tables 77 and 78 are based on*

```
SELECT normalised, gender,
    idionym, byname, dn,
    di, bergeninsid,
    bergeninsnid,
    insnidnoin,
    lindlocalisation, pred
FROM bignametable;
```

```
SELECT normalised,
    di/5978*100,
    dn/35074*100,
    insnidnoin/409*100,
    quarti, quartn,
    di/6640*100,
    dn/20000*100, pditodn,
    pbergendi, pbergendn
FROM bignametable;
```

Query C.29. *Retrieving the count of individual normalised inscriptions assigned ttags*

```
SELECT COUNT(DISTINCT inscription.insid)
FROM
(((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
INNER JOIN normalisation ON
    patterning.patid=normalisation.patid)
INNER JOIN texts ON normalisation.normid=texts.foreignid)
INNER JOIN texttags ON texts.textid=texttags.textid)
```

```
INNER JOIN ttags ON texttags.ttagid=ttags.ttagid
WHERE inscription.insid NOT IN (
SELECT DISTINCT inscription.insid FROM
((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
INNER JOIN texts ON  patterning.patid=texts.foreignid)
INNER JOIN texttags ON texts.textid=texttags.textid)
INNER JOIN ttags ON texttags.ttagid=ttags.ttagid);
```

Technically, it is not necessary to join to INSCRIPTION and TTAGS, because the *insids* are already present as FKs in TRANSLITERATION, and it is only necessary to confirm the presence of a *textid* in TEXTTAGS to know that this text has been tagged. This query includes those two tables just to show all of the tables from which attributes are involved in the result set.

Query C.30. *Retrieving the count of individual patterned inscriptions assigned ttags*

```
SELECT COUNT(DISTINCT inscription.insid)
FROM
((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
INNER JOIN texts ON  patterning.patid=texts.foreignid)
INNER JOIN texttags ON texts.textid=texttags.textid)
INNER JOIN ttags ON texttags.ttagid=ttags.ttagid
WHERE inscription.insid NOT IN
(SELECT DISTINCT inscription.insid
FROM
(((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
INNER JOIN normalisation ON
    patterning.patid=normalisation.patid)
INNER JOIN texts ON normalisation.normid=texts.foreignid)
INNER JOIN texttags ON texts.textid=texttags.textid)
INNER JOIN ttags ON texttags.ttagid=ttags.ttagid);
```

Two queries, each excluding the result set of the nested WHERE-query, are required to count the total on account of some texts being connected to patterns rather than normalisations.

Query C.31. *Retrieving the count of individual patterned inscriptions assigned a type-ttag*

```
SELECT DISTINCT ttagname
FROM ttags
WHERE ttagid IN
(SELECT ttagid FROM texttags
WHERE pctw="t" AND tagsource <> "samtextbas");
```

Query C.32. *Retrieving the count of individual patterned inscriptions assigned a content-ttag*

```
SELECT DISTINCT ttagname FROM ttags WHERE ttagid IN (SELECT
    ttagid FROM texttags WHERE pctw="c" AND tagsource <>
    "samtextbas");
```

Query C.33. *Retrieving the count of individual patterned inscriptions assigned a purpose-ttag*

```
SELECT DISTINCT ttagname FROM ttags WHERE ttagid IN (SELECT
    ttagid FROM texttags WHERE pctw="p" AND tagsource <>
    "samtextbas");
```

Query C.34. *Retrieving the count of individual patterned inscriptions assigned a writer-ttag*

```
SELECT DISTINCT ttagname FROM ttags WHERE ttagid IN (SELECT
    ttagid FROM texttags WHERE pctw="w" AND tagsource <>
    "samtextbas");
```

Query C.35. *Retrieving the count of individual patterned inscriptions assigned a situation-ttag*

```
SELECT DISTINCT ttagname FROM ttags WHERE ttagid IN (SELECT
    ttagid FROM texttags WHERE pctw="s" AND tagsource <>
    "samtextbas");
```

Query C.36. *Retrieving* insids *and their connected tags by way of* *NORMALISATION*

```
SELECT DISTINCT
    inscription.insid,
    ttags.ttagname
FROM
(((((inscription LEFT
    JOIN transliteration
    ON inscription.insid
    =
    transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid
    = patterning.tlitid)
INNER JOIN normalisation
    ON patterning.patid =
    normalisation.patid)
INNER JOIN texts ON
    normalisation.normid
    = texts.foreignid)
INNER JOIN texttags ON
    texts.textid =
    texttags.textid)
INNER JOIN ttags ON
    texttags.ttagid =
    ttags.ttagid;
```

Query C.37. *Retrieving* insids *and their connected tags by way of* *PATTERNING*

```
SELECT DISTINCT
    inscription.insid,
    ttags.ttagname
FROM
((((inscription LEFT
    JOIN transliteration
    ON inscription.insid
    =
    transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid
    = patterning.tlitid)
INNER JOIN texts ON
    patterning.patid =
    texts.foreignid)
INNER JOIN texttags ON
    texts.textid =
    texttags.textid)
INNER JOIN ttags ON
    texttags.ttagid =
    ttags.ttagid;
```

The two queries can be united into one by using the UNION-operator, which is situated between the last line of the first and the first line of the second query. It is important to remember to remove ; at the end of the first query.

Query C.38. *Retrieving the different variations of how the sides from* INS38 *can be reconnected into textual entities*

```
SELECT texts.textid, COUNT(DISTINCT texts.foreignid)
FROM
(((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
INNER JOIN normalisation ON
    patterning.patid=normalisation.patid)
```

```
INNER JOIN texts ON normalisation.normid=texts.foreignid)
INNER JOIN texttags ON texts.textid=texttags.textid)
INNER JOIN ttags ON texttags.ttagid=ttags.ttagid
WHERE inscription.insid="ins38"
GROUP BY texts.textid;
```

Query C.39. The total number of idionyms with a status association

```
SELECT COUNT(DISTINCT normalised)
FROM idionym
WHERE sostat IS NOT NULL;
```

Query C.40. Retrieving all inscriptions and their ttags in which a certain idionym appears

```
SELECT DISTINCT inscription.insid, ttags.ttagname
FROM
(((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
INNER JOIN normalisation ON
    patterning.patid=normalisation.patid)
INNER JOIN texts ON normalisation.normid=texts.foreignid)
INNER JOIN texttags ON texts.textid=texttags.textid)
INNER JOIN ttags ON texttags.ttagid=ttags.ttagid
WHERE inscription.insid IN
(SELECT DISTINCT inscription.insid
FROM
(((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
LEFT JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
LEFT JOIN sequences ON patterning.patid=sequences.patid)
LEFT JOIN inscriptionnames ON
    sequences.insnid=inscriptionnames.insnid)
INNER JOIN namejoin ON
    inscriptionnames.insnid=namejoin.insnid)
INNER JOIN idionym ON namejoin.idioid=idionym.idioid
WHERE idionym.normalised ="[insert idionym of choice]")
UNION
SELECT DISTINCT inscription.insid, ttags.ttagname
FROM
((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
```

```
INNER JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
INNER JOIN texts ON patterning.patid=texts.foreignid)
INNER JOIN texttags ON texts.textid=texttags.textid)
INNER JOIN ttags ON texttags.ttagid=ttags.ttagid
WHERE inscription.insid IN
(SELECT DISTINCT inscription.insid
FROM
(((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
LEFT JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
LEFT JOIN sequences ON patterning.patid=sequences.patid)
LEFT JOIN inscriptionnames ON
    sequences.insnid=inscriptionnames.insnid)
INNER JOIN namejoin ON
    inscriptionnames.insnid=namejoin.insnid)
INNER JOIN idionym ON namejoin.idioid=idionym.idioid
WHERE idionym.normalised ="[insert idionym of choice]");
```

Query C.41. *Creating VIEW* tagsnames

```
CREATE VIEW tagsnames AS
SELECT DISTINCT inter.insid, inter.ttagname,
    timelocatednames.normalised, timelocatednames.sostat
FROM
(SELECT DISTINCT inscription.insid, ttags.ttagname
FROM
(((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
INNER JOIN normalisation ON
    patterning.patid=normalisation.patid)
INNER JOIN texts ON normalisation.normid=texts.foreignid)
INNER JOIN texttags ON texts.textid=texttags.textid)
INNER JOIN ttags ON texttags.ttagid=ttags.ttagid
UNION
SELECT DISTINCT inscription.insid, ttags.ttagname
FROM
((((inscription LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
INNER JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
INNER JOIN texts ON patterning.patid=texts.foreignid)
```

```
INNER JOIN texttags ON texts.textid=texttags.textid)
INNER JOIN ttags ON texttags.ttagid=ttags.ttagid) AS inter
INNER JOIN timelocatednames ON
    inter.insid=timelocatednames.insid;
```

Cf. Query C.25 on the use and purpose of VIEWs.

Query C.42. Retrieving the total count of how often an idionym was connected to a tag

```
SELECT normalised, ttagname, MAX(countags)
FROM
(SELECT normalised, ttagname, COUNT(DISTINCT ttagname) AS
    countags
FROM tagsnames
WHERE  tagsource="niyrvi"
GROUP BY normalised, ttagname
UNION
SELECT normalised, ttagname, COUNT(DISTINCT ttagname) AS
    countags
FROM tagsnames
WHERE  tagsource="knirk1997gotlending"
GROUP BY normalised, ttagname
UNION
SELECT normalised, ttagname, COUNT(DISTINCT ttagname) AS
    countags
FROM tagsnames
WHERE  tagsource="liestoel1964viking"
GROUP BY normalised, ttagname
UNION
SELECT normalised, ttagname, COUNT(DISTINCT ttagname) AS
    countags
FROM tagsnames
WHERE  tagsource="marold2000"
GROUP BY normalised, ttagname
UNION
SELECT normalised, ttagname, COUNT(DISTINCT ttagname) AS
    countags
FROM tagsnames
WHERE  tagsource="runecorrespondence1968liestoel"
GROUP BY normalised, ttagname
UNION
SELECT normalised, ttagname, COUNT(DISTINCT ttagname) AS
    countags
FROM tagsnames
WHERE  tagsource="liestoelrunerfrabryggen"
```

```
GROUP BY normalised, ttagname) AS inter
GROUP BY normalised, ttagname;
```

AND sostat="[insert social status of choice or sostat IS NULL]" added to the WHERE-clauses will only return the results for that particular group.

Query C.43. *Retrieving the tags and idionyms connected to each other*

```
SELECT DISTINCT ttagname
FROM tagsnames
WHERE sostat="[insert social status of choice or sostat IS
    NULL]";
```

Query C.44. *Retrieving tags assigned to one group of idionyms, but not another*

```
SELECT DISTINCT ttagname
FROM tagsnames
WHERE sostat="[insert social status of choice or sostat IS
    NULL]"
AND ttagname NOT IN
(SELECT DISTINCT ttagname
FROM tagsnames
WHERE sostat="[insert social status of choice or sostat IS
    NULL]");
```

Query C.45. *Counting untagged inscriptions with idionyms*

```
SELECT COUNT(DISTINCT insid)
FROM ippa
WHERE insid NOT IN
(SELECT DISTINCT insid FROM alltags);
```

Query C.46. *Query returning all contexts where coordinates and excavation unit correspond*

```
CREATE VIEW validcoscontexts AS
SELECT contexts.musitid FROM
contexts INNER JOIN conunit ON contexts.musitid LIKE
    conunit.musitid
WHERE
(conunit.unitid LIKE "%-01" AND contexts.xco BETWEEN -800
    AND 0)
```

```
OR (conunit.unitid LIKE "%01" AND contexts.xco BETWEEN 0
   AND 800)
OR (conunit.unitid LIKE "%02" AND contexts.xco BETWEEN 800
   AND 1600)
OR (conunit.unitid LIKE "%03" AND contexts.xco BETWEEN 1600
   AND 2400)
OR (conunit.unitid LIKE "%04" AND contexts.xco BETWEEN 2400
   AND 3200)
OR (conunit.unitid LIKE "%05" AND contexts.xco BETWEEN 3200
   AND 4000)
OR (conunit.unitid LIKE "%06" AND contexts.xco BETWEEN 4000
   AND 4800)
OR (conunit.unitid LIKE "%07" AND contexts.xco BETWEEN 4800
   AND 5600)
OR (conunit.unitid LIKE "%08" AND contexts.xco BETWEEN 5600
   AND 6400)
OR (conunit.unitid LIKE "%09" AND contexts.xco BETWEEN 6400
   AND 7200)
OR (conunit.unitid LIKE "%10" AND contexts.xco BETWEEN 7200
   AND 8000)
OR (conunit.unitid LIKE "%11" AND contexts.xco BETWEEN 8000
   AND 8800)
OR (conunit.unitid LIKE "%12" AND contexts.xco BETWEEN 8800
   AND 9600)
UNION
SELECT contexts.musitid FROM
contexts INNER JOIN conunit ON
   contexts.musitid=conunit.musitid
WHERE
(conunit.unitid LIKE "A%" AND contexts.yco BETWEEN 0 AND
   800)
OR (conunit.unitid LIKE "A%" AND contexts.yco BETWEEN 0 AND
   800)
OR (conunit.unitid LIKE "B%" AND contexts.yco BETWEEN 800
   AND 1600)
OR (conunit.unitid LIKE "C%" AND contexts.yco BETWEEN 1600
   AND 2400)
OR (conunit.unitid LIKE "D%" AND contexts.yco BETWEEN 2400
   AND 3200)
OR (conunit.unitid LIKE "E%" AND contexts.yco BETWEEN 3200
   AND 4000)
OR (conunit.unitid LIKE "F%" AND contexts.yco BETWEEN 4000
   AND 4800)
OR (conunit.unitid LIKE "G%" AND contexts.yco BETWEEN 4800
   AND 5600)
OR (conunit.unitid LIKE "H%" AND contexts.yco BETWEEN 5600
```

```
    AND 6400)
OR (conunit.unitid LIKE "I%" AND contexts.yco BETWEEN 6400
    AND 7200)
OR (conunit.unitid LIKE "K%" AND contexts.yco BETWEEN 7200
    AND 8000)
OR (conunit.unitid LIKE "L%" AND contexts.yco BETWEEN 8000
    AND 8800)
OR (conunit.unitid LIKE "M%" AND contexts.yco BETWEEN 8800
    AND 9600)
OR (conunit.unitid LIKE "N%" AND contexts.yco BETWEEN 9600
    AND 10400)
OR (conunit.unitid LIKE "O%" AND contexts.yco BETWEEN 10400
    AND 11200)
OR (conunit.unitid LIKE "P%" AND contexts.yco BETWEEN 11200
    AND 12000)
OR (conunit.unitid LIKE "Q%" AND contexts.yco BETWEEN 12000
    AND 12800)
OR (conunit.unitid LIKE "R%" AND contexts.yco BETWEEN 12800
    AND 13600)
OR (conunit.unitid LIKE "S%" AND contexts.yco BETWEEN 13600
    AND 14400)
OR (conunit.unitid LIKE "T%" AND contexts.yco BETWEEN 14400
    AND 15200);
```

Query C.47. *Follow-up for the prior query, using the coordinates provided for objects*

```
SELECT object.objectid
FROM
(object INNER JOIN contexts ON object.musitid =
    contexts.musitid)
INNER JOIN conunit ON contexts.musitid = conunit.musitid
WHERE
```

See conditions in Query C.46.

Query C.48. *Retrieving all entries from* CONSTRUC *for which Magin 2017 and Magin 2018 added new data*

```
SELECT DISTINCT musitid
FROM construc
WHERE musitid IN
(SELECT DISTINCT musitid FROM construc WHERE bibtexkey LIKE
    "Elisabeth%")
AND bibtexkey <> "Elisabeth%";
```

The same query can be applied to any table and *-source*-column to find out which entries were added by which scholar at which point, provided *-source* contains the required values. Once NOT is added to the WHERE-clause, the result set only shows entries for which the scholar in question has not added new entries.

Query C.49. *Creating VIEW* datedonce*, containing all* insids *dated only once, and their dating*

```
CREATE VIEW datedonce AS
SELECT phaseid, insid FROM (((phases LEFT JOIN conphase ON
    phases.phaseid=conphase.conphase)
LEFT JOIN contexts ON conphase.musitid=contexts.musitid)
LEFT JOIN object ON contexts.musitid=object.musitid)
LEFT JOIN inscription ON object.objectid=inscription.altnr
WHERE insid IN
(SELECT insid FROM
(SELECT COUNT(DISTINCT phaseid), insid
FROM
(SELECT phases.phaseid, inscription.insid
FROM (((phases LEFT JOIN conphase ON
    phases.phaseid=conphase.conphase)
LEFT JOIN contexts ON conphase.musitid=contexts.musitid)
LEFT JOIN object ON contexts.musitid=object.musitid)
LEFT JOIN inscription ON object.objectid=inscription.altnr)
    AS insphasec
GROUP BY insid
HAVING COUNT(DISTINCT phaseid) = 1) AS ips);
```

Cf. Query C.25 on the use and purpose of VIEWs.

Query C.50. *Creating VIEW* datedtwice*, containing all* insids *dated more than once, and their dating*

```
CREATE VIEW datedtwice AS
SELECT phaseid, insid
FROM
(((phases LEFT JOIN conphase ON
    phases.phaseid=conphase.conphase)
LEFT JOIN contexts ON conphase.musitid=contexts.musitid)
LEFT JOIN object ON contexts.musitid=object.musitid)
LEFT JOIN inscription ON object.objectid=inscription.altnr
WHERE insid IN
(SELECT insid
FROM
(SELECT COUNT(DISTINCT phaseid), insid
```

```
FROM
(SELECT phases.phaseid, inscription.insid
FROM
(((phases LEFT JOIN conphase ON
   phases.phaseid=conphase.conphase)
LEFT JOIN contexts ON conphase.musitid=contexts.musitid)
LEFT JOIN object ON contexts.musitid=object.musitid)
LEFT JOIN inscription ON object.objectid=inscription.altnr)
   AS insphasec
GROUP BY insid
HAVING COUNT(DISTINCT phaseid) > 1) AS ips);
```

Query C.51. Count of objects dated once dating to individual building period

```
SELECT phaseid, COUNT(insid)
FROM datedonce
GROUP BY phaseid;
```

Query C.52. Count of objects dated more than once

```
SELECT phaseid, COUNT(DISTINCT insid)
FROM datedtwice
GROUP BY phaseid;
```

Query C.53. Count of all contexts with a value for fire

```
SELECT COUNT(DISTINCT
   musitid)
FROM confire
WHERE fire <> '';
```

WHERE layertype <> '' or WHERE unitid <> '' queried from CONLAYER and CONUNIT will give the respective results for these.

Query C.54. Count of all contexts with one or more related buildings

```
SELECT COUNT(DISTINCT musitid)
FROM construc;
```

Query C.55. *Count of all contexts with a value for all four of the above*

```
SELECT COUNT(DISTINCT musitid)
FROM conunit
WHERE unitid <> ''
AND musitid IN (SELECT DISTINCT musitid FROM conlayer
WHERE layertype <> '')
AND musitid IN (SELECT DISTINCT musitid FROM construc)
AND musitid IN (SELECT DISTINCT musitid FROM confire
WHERE fire <> '');
```

Query C.56. *Counting all inscriptions dated to a period*

```
SELECT COUNT(DISTINCT insid)
FROM
((conphase INNER JOIN contexts ON
    conphase.musitid=contexts.musitid)
INNER JOIN object ON contexts.musitid=object.musitid)
INNER JOIN inscription ON object.objectid=inscription.altnr;
```

Query C.57. *Creating VIEW ippa (idionyms per period all)*

```
CREATE VIEW ippa AS
SELECT DISTINCT phases.phaseid, inscription.insid,
    idionym.normalised, inscriptionnames.insnid,
    inscriptionnames.interlocutor,
    inscriptionnames.invocation, namejoin.source
FROM
(((((((((phases LEFT JOIN conphase ON
    phases.phaseid=conphase.conphase)
LEFT JOIN contexts ON conphase.musitid=contexts.musitid)
LEFT JOIN object ON contexts.musitid=object.musitid)
LEFT JOIN inscription ON object.objectid=inscription.altnr)
LEFT JOIN transliteration ON
    inscription.insid=transliteration.insid)
LEFT JOIN patterning ON
    transliteration.tlitid=patterning.tlitid)
LEFT JOIN sequences ON patterning.patid=sequences.patid)
LEFT JOIN inscriptionnames ON
    sequences.insnid=inscriptionnames.insnid)
LEFT JOIN namejoin ON
    inscriptionnames.insnid=namejoin.insnid)
LEFT JOIN idionym ON namejoin.idioid=idionym.idioid
WHERE idionym.normalised IS NOT NULL AND inscription.insid
```

```
    IS NOT NULL;
```

For this VIEW, the data subset consists of values from, respectively, PHASES, INSCRIPTION, INSCRIPTIONNAMES, NAMEJOIN and IDIONYM. Since several of the JOINs between the entity types will result in certain rows being duplicated, it is imperative to add DISTINCT.

Query C.58. *Count of distinct idionyms appearing in more than one period, disregarding objects dated more than once*

```
SELECT normalised, COUNT(DISTINCT phaseid)
FROM ippa
WHERE insid IN (SELECT insid FROM datedonce)
GROUP BY normalised
HAVING COUNT(DISTINCT phaseid) > 1;
```

Query C.59. *Count of distinct idionyms appearing in more than one period on objects dated more than once*

```
SELECT normalised, COUNT(DISTINCT phaseid)
FROM ippa
WHERE insid IN (SELECT insid FROM datedtwice)
GROUP BY normalised;
```

Query C.60. *Idionyms appearing in more than one period on objects dated more than once*

```
SELECT DISTINCT insid, normalised, phaseid
FROM ippa
WHERE insid IN (SELECT DISTINCT insid FROM datedtwice)
ORDER BY normalised, insid, phaseid;
```

Query C.61. *Count of distinct idionyms per period*

```
SELECT COUNT(DISTINCT
    normalised)
FROM ippa
WHERE phaseid LIKE
    "[insert phase of
    choice]";
```

While IPPA contains duplicates of idionyms and *insids*, only the column *normalised* (respectively *insid* for the count of objects) is queried for a given period. Using a wildcard in the WHERE-clause, e.g. "3._", solves the problem of building phases, guaranteeing that even idionyms dated to building phases of one period are only counted once. Further modifications used were AND interlocutor=1 and AND invocation=1.

Query C.62. Retrieving all idionyms dating to individual periods, cf. Query C.61

```
SELECT DISTINCT normalised
FROM ippa
WHERE phaseid LIKE "[insert phase of choice]"
ORDER BY normalised;
```

Query C.63. Count of each idionym token per period

```
SELECT phaseid,
    normalised, MAX(cinsnid)
FROM
(SELECT
    phaseid,normalised,
    COUNT(DISTINCT insnid)
    AS cinsnid
FROM ippa
WHERE
    ippa.source="markali1983"
GROUP BY phaseid,
    normalised
UNION
SELECT phaseid,normalised,
    COUNT(DISTINCT insnid)
    AS cinsnid
FROM ippa
WHERE ippa.source="niyrvi"
GROUP BY phaseid,
    normalised
UNION
SELECT phaseid,normalised,
    COUNT(DISTINCT insnid)
    AS cinsnid
FROM ippa
WHERE
    ippa.source="samtextbas"
GROUP BY phaseid,
    normalised) AS maxcount
GROUP BY phaseid,
    normalised
ORDER BY phaseid,
    normalised;
```

As in Chapter 5, the maximum number of tokens per idionym is counted. This query is the basis for several of the following analyses looking more more closely at the distribution of idionyms. It can be modified by, for example, adding AND invocation=0 to the WHERE-clauses in the first nested queries to only receive the results for idionyms identified as PNs. The two modifications used here were AND interlocutor=1 and AND invocation=1. The first returns results for instances where interlocutor is set to 1, the second those where invocation is set to 1. It should be noted, however, that tokens where both interlocutor and invocation are set to 1 appear and are counted in either result set. If idionyms used as either PNs or invocation must be excluded, the two qualifiers must be combined, for example WHERE interlocutor=1 AND invocation=0.
Adding WHERE phaseid LIKE "[insert phase of choice]" to the main query, returns only entries dated to a particular period's.
In order to avoid counting the double-dated entries twice, restricting the result set by adding WHERE insid IN (SELECT insid FROM datedonce) or alternatively WHERE insid IN (SELECT insid FROM datedtwice) in the nested query is an option that was also employed for retrieving accurate counts/building phases.
Lastly, the whole query can be nested once more into a query summing up building phase counts into a total for the whole period.

Query C.64. Summing up the individual counts for each idionym for each period, disregarding inscriptions dated multiple times

```
SELECT normalised, SUM(maxinsnids)
FROM
(SELECT phaseid, normalised, MAX(cinsnid) AS maxinsnids
FROM
(SELECT phaseid, normalised, COUNT(DISTINCT insnid) AS
    cinsnid
FROM ippa
WHERE ippa.source="markali1983" AND insid IN (SELECT insid
    FROM datedonce)
GROUP BY phaseid, normalised
UNION
SELECT phaseid, normalised, COUNT(DISTINCT insnid) AS
    cinsnid
FROM ippa
WHERE ippa.source="niyrvi" AND insid IN (SELECT insid FROM
    datedonce)
GROUP BY phaseid, normalised
UNION
SELECT phaseid, normalised, COUNT(DISTINCT insnid) AS
    cinsnid
FROM ippa
WHERE ippa.source="samtextbas" AND insid IN (SELECT insid
    FROM datedonce)
GROUP BY phaseid, normalised) AS maxcount
WHERE phaseid LIKE "[insert phase of choice]"
GROUP BY phaseid, normalised) AS sumitup
GROUP BY normalised
ORDER BY normalised;
```

Query C.65. Total count of objects carrying idionyms per period

```
SELECT COUNT(DISTINCT
    insid)
FROM ippa
WHERE phaseid LIKE
    "[insert phase of
    choice]";
```

Breaking the result set down by using *datedonce* or *datedtwice* can be replaced by DISTINCT in conjunction with a wildcard in the WHERE-clause specifying the period. Adding AND interlocutor=1 or AND invocation=1 to the WHERE-clause provides the results presented in Table 58. Excluding idionyms considered as either can be excluded from the result set by combining qualifiers in the WHERE-clause (Query C.63). This was not done for this study.

Query C.66. *Creating VIEW timelocatednames*

```
CREATE VIEW timelocatednames AS
SELECT inter.*, idionym.sostat
FROM
(SELECT DISTINCT conunit.unitid, contexts.musitid, ippa.*
FROM (((conunit LEFT JOIN contexts ON
    conunit.musitid=contexts.musitid)
LEFT JOIN object ON contexts.musitid=object.musitid)
LEFT JOIN inscription ON object.objectid=inscription.altnr)
LEFT JOIN ippa ON inscription.insid=ippa.insid
WHERE ippa.normalised IS NOT NULL AND ippa.insid IS NOT
    NULL) AS inter
INNER JOIN idionym ON inter.normalised=idionym.normalised
WHERE inter.insid IN (SELECT insid FROM singleunit);
```

Query C.67. *Total count of idionyms per period according to their social status*

```
SELECT sostat, COUNT(DISTINCT normalised)
FROM timelocatednames
WHERE phaseid LIKE "[insert phase of choice]" AND
    interlocutor=1
GROUP BY sostat;
```

Query C.68. *Total count of idionyms-tokens per period, sorted by social status*

```
SELECT sostat, SUM(tokensostatsums)
FROM
(SELECT insid, sostat, normalised, MAX(countinsnid) AS
    tokensostatsums
FROM
(SELECT DISTINCT unitid, insid, normalised, sostat,
   COUNT(DISTINCT insnid) AS countinsnid
FROM timelocatednames
WHERE interlocutor=1 AND phaseid LIKE "7.%" AND
    timelocatednames.source="samtextbas"
GROUP BY unitid, insid, normalised
UNION
SELECT DISTINCT unitid, insid, normalised, sostat,
   COUNT(DISTINCT insnid)
FROM timelocatednames
WHERE interlocutor=1 AND phaseid LIKE "7.%" AND
    timelocatednames.source="markali1983"
GROUP BY unitid, insid, normalised
```

```
UNION
SELECT DISTINCT unitid, insid, normalised, sostat,
   COUNT(DISTINCT insnid)
FROM timelocatednames
WHERE interlocutor=1 AND phaseid LIKE "7.%" AND
    timelocatednames.source="niyrvi"
GROUP BY unitid, insid, normalised)
AS inbetween
GROUP BY normalised, insid, sostat) AS sumitup
GROUP BY sostat;
```

The principle is the same as before (C.64), although from a different dataset which now also includes information about the potential social status of idionyms. Tokens dating to more than one period are counted once for each, and tokens normalised as different idionyms appear as many times as there are different normalisations for them.

Query C.69. *All idionyms appearing per excavation unit and period with their social status*

```
SELECT inbetween.unitid, inbetween.insid,
    inbetween.normalised, inbetween.sostat,
   MAX(inbetween.countinsnid), idionym.gender
FROM
(SELECT DISTINCT unitid, insid, normalised, sostat,
   COUNT(DISTINCT insnid) AS countinsnid
FROM timelocatednames
WHERE interlocutor=1 AND phaseid LIKE "[insert phase of
    choice]" AND timelocatednames.source="samtextbas"
GROUP BY unitid, insid, normalised
UNION
SELECT DISTINCT unitid, insid, normalised, sostat,
   COUNT(DISTINCT insnid) AS countinsnid
FROM timelocatednames
WHERE interlocutor=1 AND phaseid LIKE "[insert phase of
    choice]" AND timelocatednames.source="markali1983"
GROUP BY unitid, insid, normalised
UNION
SELECT DISTINCT unitid, insid, normalised, sostat,
   COUNT(DISTINCT insnid) AS countinsnid
FROM timelocatednames
WHERE interlocutor=1 AND phaseid LIKE "[insert phase of
    choice]" AND timelocatednames.source="niyrvi"
GROUP BY unitid, insid, normalised)
AS inbetween
INNER JOIN idionym ON
    inbetween.normalised=idionym.normalised
```

```
GROUP BY inbetween.unitid, inbetween.insid,
    inbetween.normalised;
```

Using WHERE inbetween.sostat="IH/IL/NH/NL/PSH/PSL/IS NULL" returns only the records for each group.

Query C.70. *Total count of interlocutor-idionyms per period*

```
SELECT COUNT(DISTINCT normalised)
FROM timelocatednames
WHERE phaseid LIKE "[insert phase of choice]" AND
    interlocutor=1;
```

Adding *sostat* as a column provides the numbers by social status, while swapping *normalised* for *insid* provides the total count of inscriptions.

Query C.71. *Potential count of individuals the idionyms belong to*

```
SELECT SUM(individs)
FROM (SELECT insid, MAX(countinsnid) AS individs
FROM
(SELECT DISTINCT insid, COUNT(DISTINCT insnid) AS
    countinsnid
FROM timelocatednames
WHERE interlocutor=1 AND phaseid LIKE "[insert phase of
    choice]" AND timelocatednames.source="samtextbas"
GROUP BY insid
UNION
SELECT DISTINCT insid, COUNT(DISTINCT insnid) AS countinsnid
FROM timelocatednames
WHERE interlocutor=1 AND phaseid LIKE "[insert phase of
    choice]" AND timelocatednames.source="markali1983"
GROUP BY insid
UNION
SELECT DISTINCT insid, COUNT(DISTINCT insnid) AS countinsnid
FROM timelocatednames
WHERE interlocutor=1 AND phaseid LIKE "[insert phase of
    choice]" AND timelocatednames.source="niyrvi"
GROUP BY insid) AS inbetween
GROUP BY insid) AS sumitup;
```

Query C.72. Creating VIEW datelocatedtags

```
CREATE VIEW datelocatedtags AS
SELECT DISTINCT inter.*, inbetween.phaseid
FROM
(SELECT conunit.unitid, conunit.musitid, alltags.*
FROM (((conunit LEFT JOIN contexts ON
    conunit.musitid=contexts.musitid)
LEFT JOIN object ON contexts.musitid=object.musitid)
LEFT JOIN inscription ON object.objectid=inscription.altnr)
INNER JOIN alltags ON inscription.insid=alltags.insid) AS
    inter
INNER JOIN
(SELECT DISTINCT phases.phaseid, contexts.musitid
FROM ((phases INNER JOIN conphase ON
    phases.phaseid=conphase.conphase)
INNER JOIN contexts ON conphase.musitid=contexts.musitid))
    AS inbetween
ON inter.musitid=inbetween.musitid
WHERE inter.insid IN (SELECT DISTINCT insid FROM
    singleunit);
```

Query C.73. Retrieving available coordinates for objects carrying invocation-idionym or tagged prayer/incantation/christian/amulet

```
SELECT insid, oxco/100 AS oxco, oyco/100 AS oyco
FROM qgis
WHERE oxco IS NOT NULL AND oyco IS NOT NULL
AND insid IN (SELECT insid FROM datelocatedtags WHERE
    phaseid LIKE "[insert phase]" AND (ttagname="prayer" OR
    ttagname="incantation" OR ttagname="christian" OR
    ttagname="amulet"))
UNION
SELECT insid, cxco/100 AS cxco, cyco/100 AS cyco
FROM qgis
WHERE cxco IS NOT NULL AND cyco IS NOT NULL
AND insid IN
(SELECT insid
FROM datelocatedtags
WHERE phaseid LIKE "[insert phase]" AND (ttagname="prayer"
    OR ttagname="incantation" OR ttagname="christian" OR
    ttagname="amulet"))
UNION
SELECT insid, oxco/100 AS oxco, oyco/100 AS oyco
FROM qgis
```

```
WHERE oxco IS NOT NULL AND oyco IS NOT NULL
AND insid IN
(SELECT insid
FROM ippa
WHERE invocation=1 AND phaseid LIKE "[insert phase]")
UNION
SELECT insid, cxco/100 AS cxco, cyco/100 AS cyco
FROM qgis
WHERE cxco IS NOT NULL AND cyco IS NOT NULL
AND insid IN
(SELECT insid
FROM ippa
WHERE invocation=1 AND phaseid LIKE "[insert phase]");
```

Query C.74. *Retrieving available coordinates for objects carrying invocation-idionym or tagged* prayer/incantation/christian/amulet

```
SELECT unitid, COUNT(DISTINCT insid)
FROM qgis
WHERE (((oxco OR oyco) IS NULL OR (oxco AND oyco) IS NULL)
   AND ((cxco AND cyco) IS NULL OR (cxco AND cyco) IS NULL))
AND insid IN
(SELECT insid
FROM datelocatedtags
WHERE phaseid LIKE "[insert phase]" AND (ttagname="prayer"
   OR ttagname="incantation" OR ttagname="christian" OR
   ttagname="amulet"))
GROUP BY unitid
UNION
SELECT unitid, COUNT(DISTINCT insid)
FROM qgis
WHERE (((oxco OR oyco) IS NULL OR (oxco AND oyco) IS NULL)
   AND ((cxco AND cyco) IS NULL OR (cxco AND cyco) IS NULL))
AND insid IN
(SELECT insid
FROM ippa
WHERE invocation=1 AND phaseid LIKE "[insert phase]")
GROUP BY unitid;
```

List of queries and code snippets

List of Tables

List of Figures

Bibliography

Aldrin, E. 2016. Names and Identity. *In*: C. Hough & D. Izdebska, eds. *The Oxford Handbook of Names and Naming*. Oxford handbooks in linguistics. Oxford: Oxford University Press, 382-394.

Andersson, T. 2003. Personennamen. *In*: H. Beck, D. Geuenich & H. Steuer, eds. *Östgötalag - Pfalz und Pfalzen*. 2nd ed. Reallexikon der germanischen Alterstumskunde 22. Berlin: Walter de Gruyter, 589-614.

Antonsen, E. H. 1975. *A concise grammar of the older runic inscriptions*. Sprachstrukturen. Reihe A, Historische Sprachstrukturen 3. Tübingen: M. Niemeyer Verlag. Retrieved from: https://ebookcentral.proquest.com/lib/nottingham/detail.action?docID=978579.

ASCII Codes CP 865 (Nordic languages) October 2018. Retrieved from: https://www.ascii-codes.com/cp865.html (accessed 5th October 2018).

Barnes, M. P. 2012. *Runes: a handbook*. Woodbridge: Boydell Press.

Barnes, M. P. 2013. What Is Runology, and Where Does It Stand Today? *Futhark: International Journal of Runic Studies* 4, 1-6. Retrieved from: https://uu.diva-portal.org/smash/get/diva2:682689/FULLTEXT01.pdf.

Beck, H. 2002. Skandinavische Beiträge zur Personennamenforschung. *In*: D. Geuenich, W. Haubrichs & J. Jarnut, eds. *Person und Name. Methodische Probleme bei der Erstellung eines Personennamenbuches des Frühmittelalters*. Ergänzungsbände zum Reallexikon der Germanischen Altertumskunde 32. Berlin: Walter de Gruyter, 127-147.

Beech, G. T., M. Bourin & P. Chareille, eds. 2002. *Personal names studies of medieval Europe: social identity and familial structures*. Kalamazoo: Medieval Institute Publications, Western Michigan University.

Bianchi, M. 2017. *Projektet Evighetsrunor*. Retrieved from: https://www.raa.se/kulturarv/runor-och-runstenar/projekt-om-runor/projektet-evighetsrunor/ (accessed 25th May 2021).

Bianchi, M. 2020. *Runor är här!* Retrieved from: http://www.runforum.nordiska.uu.se/runor-ar-har/ (accessed 25th May 2021).

Bourin, M. 2002. How Changes in Naming Reflect the Evolution of Familial Structures in Southern Europe, 950-1250. *In*: G. T. Beech, M. Bourin & P. Chareille, eds. *Personal names studies of medieval Europe: social identity and familial structures*. Kalamazoo: Medieval Institute Publications, Western Michigan University, 3-13.

Bramwell, E. S. 2016. Personal Names and Anthropology. *In*: C. Hough & D. Izdebska, eds. *The Oxford Handbook of Names and Naming*. Oxford handbooks in linguistics. Oxford: Oxford University Press, 263-278.

Brylla, E. 2016. Bynames and Nicknames. *In*: C. Hough & D. Izdebska, eds. *The Oxford Handbook of Names and Naming*. Oxford handbooks in linguistics. Oxford: Oxford University Press, 237-250.

Burkhardt, A., ed. 1995. *Namenforschung: ein internationales Handbuch zur Onomastik*. Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of linguistics and communication science 11.1. Berlin: Walter de Gruyter. Retrieved from: http://han.sub.uni-goettingen.de/han/HSK/www.degruyter.com/doi/book/10.1515/9783110114263.1.

Busa, R. A. 2004. Foreword: Perspectives on the Digital Humanities. *In*: J. Unsworth, R. G. Siemens & S. Schreibman, eds. *A Companion to Digital Humanities*. Blackwell companions to literature and culture 26. Malden, MA: Blackwell Publishing Ltd, xvi-xxi. DOI: 10.1002/9780470999875.

Buttinger, S. 2012. *Das Mittelalter*. 3rd ed. Stuttgart: wbg Theiss. Retrieved from: https://www.ebook.de/de/product/18107266/sabine_buttinger_das_mittelalter.html.

Carocci, S. 2011. Social mobility and the Middle Ages. *Continuity and Change* 26.3, 367-404. DOI: 10.1017/s0268416011000257.

Chareille, P. 2002. Methodological Problems in a Quantitative Approach to Changes in Naming. *In*: G. T. Beech, M. Bourin & P. Chareille, eds. *Personal names studies of medieval Europe: social identity and familial structures*. Kalamazoo: Medieval Institute Publications, Western Michigan University, 15-27.

Christensen, A. E. 1985. Boat finds from Bryggen. *In*: A. E. Herteig, ed. *The archaeological excavations at Bryggen, "The German Wharf", in Bergen, 1955-68*. The Bryggen Papers. Main Series 1. Bergen: Universitetsforlaget, 47-278. DOI: https://doi.org/10.15845/bryggen.v1o.

Deegan, M. & S. Tanner 2004. Conversion of Primary Sources. *In*: J. Unsworth, R. G. Siemens & S. Schreibman, eds. *A Companion to Digital Humanities*. Blackwell companions to literature and culture 26. Malden, MA: Blackwell Publishing Ltd, 488-504. DOI: 10.1002/9780470999875.

DI 1857-1952. *Diplomatarium Islandicum. íslenzkt fornbréfasafn, sem hefir inni að halda bréf og gjörninga, dóma og máldaga, og aðrar skrár, er snerta Ísland eða íslenzka menn* (DI). Reykjavík: Hið Íslenska bókmenntafélag. Retrieved from: https://baekur.is/bok/000197700/16/Diplomatarium_Islandicum__.

DN 1848-1920. *Diplomatarium Norvegicum* (DN). Oslo: Kommisjonen for Diplomatarium Norvegicum.

Düwel, K. 2008. *Runenkunde*. 4th ed. Stuttgart: Metzler.

Düwel, K., R. Nedoma & S. Oehrl 2020. *Die südgermanischen Runeninschriften*. Ergänzung zum Reallexikon der Germanischen Altertumskunde 119. Berlin, Boston: Walter de Gruyter. DOI: 10.1515/9783110533187.

Dyvik, H. 1985. Runer fra Bryggen. *In*: I. Øye, ed. *Middelalderbyen*. Onsdagskvelder i Bryggens Museum I. Bergen, 133-148.

Dyvik, H. 1996. Terje Spurkland: En fonografematisk analyse av runematerialet fra Bryggen i Bergen. Doktordisputas ved Universitetet i Oslo 20. mars 1993. *Maal og Minne* 1, 3-29.

Ebel, E. 1987. Der Fernhandel von der Wikingerzeit bis in das 12. Jahrhundert in Nordeuropa nach altnordischen Quellen. *In*: K. Düwel, H. Jankuhn, H. Siems & D. Timpe, eds. *Untersuchungen zu Handel und Verkehr der vor- und frühgeschichtlichen Zeit in Mittel- und Nordeuropa. Teil IV. Der Handel der Karolinger- und Wikingerzeit*. Abhandlungen der Akademie der Wissenschaften in Göttingen. Philologisch-historische Klasse. Dritte Folge 156. Göttingen: Vandenhoeck & Ruprecht, 266-312.

Elmasri, R. & S. Navathe 2017. *Fundamentals of database systems*. 7th ed. Harlow: Pearson Education.

Ersland, G. A. 1994. *Kven eigde byen? : ei gransking av opphavet og utviklinga av grunnleige i Bergen og eit utval nordeuropeiske byar*. PhD thesis. Bergen: Historisk institutt, Universitetet i Bergen.

Evans, M. 2016. Curating the Language of Letters: Historical Linguistic Methods in the Museum. *In*: M. Hayler & G. Griffin, eds. *Research methods for creating and curating data in the digital humanities*. Research methods for the arts and humanities. Edinburgh: Edinburgh University Press, 44-61.

Findell, M. 2014. *Runes*. London: British Museum Press.

Fuchs, F. L. 2022. *Why I Like Using UUIDs on Database Tables*. Retrieved from: https://betterprogramming.pub/why-i-like-using-uuids-on-database-tables-ccab8c350f8a.

Fuhrmann, B. 2014. *Hinter festen Mauern*. Stuttgart: wbg Theiss. Retrieved from: https://www.ebook.de/de/product/21837318/bernd_fuhrmann_hinter_festen_mauern.html.

Geary, P. 2002. Foreword. *In*: G. T. Beech, M. Bourin & P. Chareille, eds. *Personal names studies of medieval Europe: social identity and familial structures*. Kalamazoo: Medieval Institute Publications, Western Michigan University, vii-viii.

Gunnes, E. 1983. Utenlandsk navneskikk i norsk middelalder. *Maal og Minne* 3-4, 150-169.

Haavaldsen, A. & E. S. Ore 1995-2003. *Runes in Bergen. Preliminary report from the project "Computerising the runic inscriptions at the Historical museum in Bergen". 1. English edition*. Retrieved from: https://www.nb.no/baser/runer/ribwww/english/runeindex.html#Heading3.

Hagland, J. R. 1988a. Nokre onomastiske sider ved runematerialet frå bygrunnen i Trondheim og Bryggen i Bergen. *Studia Anthroponymica Scandinavica* 6, 13-25.

Hagland, J. R. 1988b. Runematerialet frå gravingane i Trondheim og Bergen som kjelder til islandshandelens historie i mellomalderen. *Historisk Tidsskrift* 67, 145-156.

Hagland, J. R. 1989. Islands eldste runetradisjon i lys av nye funn frå Trondheim og Bergen. *Arkiv för Nordisk Filologi* 104, 89-102.

Halvorsen, E. F. 1975. Person- og slektsnavntradisjoner i Norge. *In*: *Norske stedsnavn/stadnamn*. Oslo: Grøndahl & Søn Forlag A/S, 157-171.

Halvorsen, E. F. 1981. Personnavn. Island og Norge. *In*: *Kulturhistorisk leksikon for nordisk middelalder*. Kulturhistorisk leksikon for nordisk middelalder 13, 199-206.

Halvorsen, E. F. 1984. Innlån av fremmede personnavn i Norge i tidlig gammelnorsk tid. *In*: B. Fidjestøl, ed. *Festskrift til Ludvig Holm-Olsen på hans 70-årsdag den 9. jun 1984*. Øvre Ervik: Alvheim & Eide, 114-123.

Hansen, G. 1998. The Bryggen chronology. New light upon the dating of fire layer sequence before V. *In*: I. Øye, ed. *Medieval Fires in Bergen – Revisited*. The Bryggen Papers. Supplementary Series 6. Bergen: Fagbokforlaget, 81-127. DOI: https://doi.org/10.15845/bryggen.v6Suppl..

Hansen, G. 2005a. *Bergen c 800–c1170. The emergence of a town*. The Bryggen Papers. Main Series 6. Bergen: Fagbokforlaget. DOI: https://doi.org/10.15845/bryggen.v60.

Hansen, G. 2005b. *Bryggebrannen 1955 – et vendepunkt. Middelalderarkeologi i Bergensmiljøet før og etter 1955*. Bergen: Bryggens museum.

Hansen, G. 2006. Kvinner, barn og pølsepinner - Demografiske drypp fra det eldste Bergen. *In*: R. Barndon, S. M. Innselset, K. K. Kristoffersen & T. K. Lødøen, eds. *Samfunn, symboler og identitet – Festskrift til Gro Mandt på 70-årsdagen*. UBAS – Universitetet i Bergen Arkeologiske Skrifter 3. Bergen: Universitetet i Bergen, 305-319.

Hansen, G. 2008. Konger og byfolk i det eldste Bergen – byoppkomst i et aktørperspektiv. *In*: H. Andersson, G. Hansen & I. Øye, eds. *De første 200 årene – nytt blikk på 27 skandinaviske middelalderbyer*. Bergen: Institutt for arkeologi, historie, kulturvitenskap og religion, Universitetet i Bergen, 15-39.

Hansen, G. 2010. New pathways for Women in Twelfth-century Bergen, Norway? *In*: L. H. Dommasnes, T. Hjørungdal, S. Montón-Subías, M. Sánchez Romero & N. L. Wicker, eds. *Situating Gender in European Archaeologies*. Budapest: Archaeolingua Alapítvány, 245-260.

Hansen, G. 2015a. Bergen AD 1020/30-1170: Between Plans and Reality. *In*: J. H. Barrett & S. J. Gibbon, eds. *Maritime Societies of the Viking and Medieval World*. Society for Medieval Archaeology Monograph 27. Leeds: Maney Publishing, 182-197.

Hansen, G. 2015b. Itinerant craftspeople in 12th century Bergen, Norway – aspects of their social identities. *In*: G. Hansen, S. P. Ashby & I. Baug, eds. *Everyday Products in the Middle Ages. Crafts, Consumption and the Individual in Northern Europe c. AD 800–1600*. Oxford: Oxbow Books, 28-50.

Hansen, G. 2015c. Sko, kammer og klær. En nedenfra-studie av bergensernes økonomiske evne på 1100-tallet. *In*: J. A. Risvaag, R. Berge & T. Brattli, eds. *Inn i fortida – ut i verden – i museet!* Vitark. Acta Archaeologica Nidarosiensia 9. Trondheim: NTNU, Vitenskapsmuseet, Seksjon for arkeologi og kulturhistorie og Museumsforlaget.

Hansen, G. 2016. Luxury for everyone? Embroideries on Leather Shoes and the Consumption of Silk Yarn in 11th–13th Century Northern Europe. *In*: A. L. Huang & C. Jahnke, eds. *Textiles and the Medieval Economy. Production, Trade and Consumption of Textiles 8th–16th Centuries*. Ancient Textiles Series 16. Oxford: Oxbow Books, 87-103.

Hansen, G., S. P. Ashby & I. Baug, eds. 2015. *Everyday products in the Middle Ages. Crafts, consumption and the individual in northern Europe, c. AD 800-1600*. Oxford: Oxbow Books, 1-10.

Hansen, G., B. Hope & S. S. Mygland 2017. “Migreringsprosjketet 2015-2017. Rapport om migrering av Middelaldersamlingens digitale BRM-funnkataloger til de norske Universitetsmuseenes felles databaseløsning, MUSITbasen for arkeologi”.

Harrington, J. L. 2009. *Relational database design and implementation: clearly explained*. 3rd ed. Amsterdam: Elsevier.

Haugen, O. E. 2000. *Alfabetisk oversyn over Gullskoen runefont, versjon 2.1*. Retrieved from: https://folk.uib.no/hnooh/runefont/PDF-filar/AlfabetGullskoen.pdf.

Haugen, O. E. 2013. Tekstkritikk og tekstfilologi. *In*: O. E. Haugen, ed. *Handbok i norrøn filologi*. 2nd ed. Bergen: Fagbokforlaget, 76-126.

Haugen, O. E., ed. 2019. *Menota Handbook 3.0. Guidelines for the electronic encoding of Medieval Nordic primary sources*. Retrieved from: https://www.menota.org/HB3_index.xml.

Hauksson, Þ., ed. 2007. *Sverris saga* (Sverris saga). Íslenzk fornrit 30. Reykjavík: Hið Íslenzka Fornritafélag.

Hayler, M. & G. Griffin 2016a. Introduction. *In*: M. Hayler & G. Griffin, eds. *Research methods for creating and curating data in the digital humanities*. Research methods for the arts and humanities. Edinburgh: Edinburgh University Press, 1-13.

Hayler, M. & G. Griffin, eds. 2016b. *Research methods for reading digital data in the digital humanities*. Research methods for the arts and humanities. Edinburgh: Edinburgh University Press.

Helle, K. 1982. *Bergen bys historie. Kongssete og kjøpstad. Fra opphavet til 1536*. 2nd ed. Bergen: Alma Mater Forlag.

Helle, K. 1998. Medieval fires in Bergen according to written sources. *In*: I. Øye, ed. *Medieval Fires in Bergen – Revisited*. The Bryggen Papers. Supplementary Series 6. Bergen: Fagbokforlaget, 15-80. DOI: https://doi.org/10.15845/bryggen.v6Suppl..

Herteig, A. E. 1985. *The Archaeological Excavations at Bryggen, “The German Wharf”, in Bergen, 1955–68*. The Bryggen Papers. Main Series 1. Bergen: Universitetsforlaget, 9-46. DOI: https://doi.org/10.15845/bryggen.v10.

Herteig, A. E. 1990. *The buildings at Bryggen. Their topographical and chronological development*. Vol. 1. The Bryggen Papers. Main Series 3. Bergen: Norwegian University Press. DOI: https://doi.org/10.15845/bryggen.v31.

Herteig, A. E. 1991. *The buildings at Bryggen. Their topographical and chronological development*. Vol. 2. The Bryggen Papers. Main Series 3. Bergen: Norwegian University Press. DOI: https://doi.org/10.15845/bryggen.v32.

Hirschmann, F. G. 2016. *Die Stadt im Mittelalter*. 2., aktualisierte und erweiterte Auflage. Boston, Massachusetts: Walter de Gruyter.

Hockey, S. 2004. The History of Humanities Computing. *In*: J. Unsworth, R. G. Siemens & S. Schreibman, eds. *A Companion to Digital Humanities*. Blackwell companions to literature and culture 26. Malden, MA: Blackwell Publishing Ltd, 3-19. DOI: 10.1002/9780470999875.

Hough, C. 2016. Introduction. *In*: C. Hough & D. Izdebska, eds. *The Oxford Handbook of Names and Naming*. Oxford handbooks in linguistics. Oxford: Oxford University Press, 1-38.

Hough, C. & D. Izdebska, eds. 2016. *The Oxford Handbook of Names and Naming*. Oxford handbooks in linguistics. Oxford: Oxford University Press.

Janzén, A. 1947a. De fornvästnordiska personnamnen. *In*: A. Janzén, ed. *Personnavne*. Nordisk kultur VII. Stockholm: Albert Bonnier, 22-186.

Janzén, A. 1947b. Inledning. *In*: A. Janzén, ed. *Personnavne*. Nordisk kultur VII. Stockholm: Albert Bonnier, 1-4.

Janzén, A., ed. 1947c. *Personnavne*. Vol. VII. Nordisk kultur. Stockholm: Albert Bonnier.

Johannessen, O.-J. 2002. Kristne personnavn i norsk middelalder. *In*: S. Sigmundsson, ed. *I: Kristendommens indflydelse på nordisk navngivning. Rapport fra NORNAs 28. symposium i Skålholt 25.–28. maj 2000*. NORNA-rapporter 74. Uppsala: NORNA-förlaget, 29-57.

Johnsen, I. S. 1981. "Personal Names in Inscriptions from Towns of Medieval Norway". *In*: C. W. Thompson, ed. *Proceedings of the First International Symposium on Runes and Runic Inscriptions*. Michigan Germanic Studies VII. Ann Arbor, Michigan: Department of Germanic Languages and Literatures, The University of Michigan, 119-128.

Johnsen, I. S. 1987. Die Runeninschriften über Handel und Verkehr aus Bergen (Norwegen). *In*: K. Düwel, H. Jankuhn, H. Siems & D. Timpe, eds. *Untersuchungen zu Handel und Verkehr der vor- und frühgeschichtlichen Zeit in Mittel- und Nordeuropa. Teil IV. Der Handel der Karolinger- und Wikingerzeit*. Abhandlungen der Akademie der Wissenschaften in Göttingen. Philologisch-historische Klasse. Dritte Folge 156. Göttingen: Vandenhoeck & Ruprecht, 716-744.

Knirk, J. E. 1997. Kunne en gotlending finne romantikk i middelalderens Bergen? Kjærlighetsdikt med runer fra Bryggen i Bergen. *In*: R. Bohn, H. Rebas & T. Siltberg, eds. *Archiv und Geschichte im Ostseeraum: Festschrift für Sten Körner*. Studia Septemtrionalia 3. Frankfurt am Main: Peter Lang, 25-37.

Kruken, K. 2013. *Norsk personnamnleksikon*. 3rd ed. Oslo: Samlaget.

Laliena, C. 2002. Personal Names, Immigration, and Cultural Change: Francos and Muslims in the Medieval Crown of Aragon. *In*: G. T. Beech, M. Bourin & P. Chareille, eds. *Personal names studies of medieval Europe: social identity and familial structures*. Kalamazoo: Medieval Institute Publications, Western Michigan University, 121-130.

Larsen, A. J. 1992. *Footwear from the Gullskoen area of Bryggen*. The Bryggen Papers. Main Series 4. Scandinavian University Press. DOI: https://doi.org/10.15845/bryggen.v40.

Laue, A. 2004. How the Computer Works. *In*: J. Unsworth, R. G. Siemens & S. Schreibman, eds. *A Companion to Digital Humanities*. Blackwell companions to literature and culture 26. Malden, MA: Blackwell Publishing Ltd, 145-160. DOI: 10.1002/9780470999875.

Le Jan, R. 2002. Personal Names and the Transmission of Kinship in Early Medieval Society (Sixth to Tenth Centuries). *In*: G. T. Beech, M. Bourin & P. Chareille, eds. *Personal names studies of medieval Europe: social identity and familial structures*. Kalamazoo: Medieval Institute Publications, Western Michigan University, 31-50.

Leibring, K. 2016. Given Names in European Naming Systems. *In*: C. Hough & D. Izdebska, eds. *The Oxford Handbook of Names and Naming*. Oxford handbooks in linguistics. Oxford: Oxford University Press, 199-213.

Lerche Nielsen, M. 1997. Runologien mellem sprogvidenskaben og arkæologien – med et sideblik på de forskellige tolkninger af Glavendrupindskriften. *In*: H. Bekker-Nielsen & H. F. Nielsen, eds. *Beretning fra sekstende tværfaglige vikingesymposium*. Højbjerg: Hikuin, 37-51.

Liestøl, A. 1964a. Runer frå Bryggen. *Viking* XXVII, 5-53.

Liestøl, A. 1964b. *Runer frå Bryggen (med etterskrift)*.

Liestøl, A. 1968. Correspondence in Runes. *Medieval Scandinavia* 1.

Liestøl, A. 1970. En uartig historisk runeinnskrift. *KUML* 20.

Liestøl, A. 1973. Runeninschriften von der Bryggen in Bergen (Norwegen). *ZAM Zeitschrift für Archäologie des Mittelalters* 1, 129-139.

Liestøl, A. 1974. Runic Voices from Towns of Ancient Norway. *Scandinavica* 13.1, 19-33.

Liestøl, A. & I. S. Johnsen 1980-1990. *Norges innskrifter med de yngre runer: Bryggen i Bergen* (NIYR VI). Ed. by J. E. Knirk. Norges innskrifter med de yngre runer VI. Oslo: Kjeldeskriftfondet.

Lind, E. H. 1931. *Norsk-isländska namn ock fingerade namn från medeltiden. Supplementband* (NID-S). Uppsala: Lundequistska bokhandeln. Retrieved from: https://gubox.app.box.com/s/n77bk5rb4ykiod9m4quctvj7jb5clu9j.

Lind, E. H. 1905-1915. *Norsk-isländska dopnamn ock fingerade namn från medeltiden* (NID). Uppsala: Lundequistska bokhandeln. Retrieved from: https://gubox.app.box.com/s/ydwx7wwlh7iopnoulmj1p4kgeco6olff.

Loveluck, C. 2013. *Northwest Europe in the early Middle Ages, c. AD 600-1150 : a comparative archaeology*. New York: Cambridge University Press.

Lundström, W. 8th January 1995. *Proposal to ISO/IEC JTC1/SC2/WG2 Concerning Inclusion into ISO/IEC 10646 of the Repertoire of Runic Characters*. Tech. rep. Central Board of National Antiquities Sweden.

Magin, E. M. 2014. *Die rúnakefli von Bryggen in Bergen – Möglichkeiten und Grenzen des Materials*. MA thesis. Georg-August-Universität Göttingen, Philosophische Fakultät.

Magin, E. M. 2017. *Additions and corrections of database entries pertaining to the fields concerning Lag, Brann, Diverse kommentar, Bygningsrelasjoner, Coordinates, Phases*.

Magin, E. M. 2018. *Additions and corrections of database entries pertaining to the fields concerning Lag, Brann, Diverse kommentar, Bygningsrelasjoner, Coordinates, Phases*.

Magin, E. M. & M. Smith 2023. (R)Unicode: Encoding and Sustainability Issues in Runology. *Digital Humanities in the Nordic and Baltic Countries Publications* 5.1, 121-136. DOI: https://doi.org/10.5617/dhnbpub.10657.

Markali, K. 1983. *Personnavnsmaterialet i runeinnskriftene fra Bryggen i Bergen*. MA thesis. Universitetet i Oslo.

Marold, E. 2000. Bergen als literarischer Umschlagplatz. *In*: F. Paul, J. Grage & W. Heizmann, eds. *Arbeiten zur Skandinavistik. 13. Arbeitstagung der deutschsprachigen Skandinavistik, 29.7.-3.8.1997 in Lysebu (Oslo)*. Frankfurt am Main: Peter Lang, 189-201.

MENOTA 2020. *Medieval Nordic Text Archive* (MENOTA). Retrieved from: https://www.menota.org/forside.xhtml (accessed 26th October 2020).

Meldgaard, E. V. 1994. De kristne personnavne kommer. *In*: G. Fellows-Jensen & B. Holmberg, eds. *Vikingetidens sted- og personnavne: rapport från NORNA:s 22. symposium i København 14.-16. januar 1993*. NORNA-rapporter / Nordiska Samarbetskommittén för Namnforskning 54. Uppsala: NORNA-förlaget, 201-217.

Molaug, S. 1998. *Smykker og draktutstyr fra middelalderens Bergen: en arkeologisk analyse i tid og rom*. MA thesis. Bergen: Universitetet i Bergen.

Mygland, S. S. 2007. *Children in medieval Bergen. An archaeological analysis of child-related articles*. The Bryggen Papers. Main Series 7. Bergen: Fagbokforlaget. DOI: https://doi.org/10.15845/bryggen.v70.

Mygland, S. S. 2015. 'Female' Activities, 'Female' Artefacts? A Theoretical Approach to Women and Gender in Medieval Bergen. *In*: *Nordic Middle Ages – Artefacts, Landscapes and Society. Essays in Honour of Ingvild Øye on her 70th Birthday*. Bergen: University of Bergen, Faculty of Humanities, Dapartment of Archaeology, History, Cultural Studies and Religion, 241-250.

Mygland, S. S. 2023. *Women in Medieval Bergen. Gender and Material Culture*. The Bryggen Papers 9. Bergen: The University Museum of Bergen & The Faculty of Humanities, University of Bergen. DOI: 10.15845/bryggen.v9.

Nedkvitne, A. 1989. Runepinner og handelshistorie. *Historisk tidsskrift* 68, 348-350.

Nordanskog, G. 2006. *Föreställd hedendom: tidigmedeltida skandinaviska kyrkportar i forskning och historia*. Vägar till Midgård 9. Lund: Nordic Academic Press.

Nordby, J. K. 2018. *Kryptografi i runeinnskrifter fra vikingtid og middelalder*. PhD thesis. Universitetet i Oslo, Det humanistiske fakultetet, Institutt for lingvistiske og nordiske studier.

Nowak, S. 2003. *Schrift auf den Goldbrakteaten der Völkerwanderungszeit: Untersuchungen zu den Formen der Schriftzeichen und zu formalen und inhaltlichen Aspekten der Inschriften = Writing on the Migration-Period Gold Bracteates*. PhD thesis. Georg-August-Universität zu Göttingen, Philosophische Fakultät. Retrieved from: http://resolver.sub.uni-goettingen.de/purl/?webdoc-512.

Nygren, T., Z. Frank, N. Bauch & E. Steiner 2016. Connecting with the Past: Opportunities and Challenges in Digital History. *In*: M. Hayler & G. Griffin, eds. *Research methods for creating and curating data in the digital humanities*. Research methods for the arts and humanities. Edinburgh: Edinburgh University Press, 62-86.

Nyström, S. 2016. Names and Meaning. *In*: C. Hough & D. Izdebska, eds. *The Oxford Handbook of Names and Naming*. Oxford handbooks in linguistics. Oxford: Oxford University Press, 39-51.

Olsen, O. M. 2004. Medieval fishing tackle from Bergen. *In*: I. Øye, ed. *Medieval fishing tackle from Bergen and Borgund*. The Bryggen Papers. Main Series 5. Bergen: Fagbokforlaget, 7-106. DOI: https://doi.org/10.15845/bryggen.v50.

Ore, E. S. October 2002. *Runetype - faglig arbeid*. Retrieved from: https://www.nb.no/baser/runer/Arbeidsrapport.html (accessed 8th October 2018).

Ore, E. S., F. J. Tweedie & C. Dougan 1998. *Computers, statistics, and the grouping of rune forms*. Retrieved from: https://www.nb.no/baser/runer/drh98.html (accessed 8th October 2018).

Owe, J. 2014. *Samnordisk Runtextdatabas. Rundata for Windows 3.1*. Tech. rep. Uppsala Universitet.

Øye, I. 1988. *Textile equipment and its working environment, Bryggen in Bergen c 1150 - 1500*. The Bryggen Papers. Main Series 2. Bergen: Norwegian University Press. DOI: https://doi.org/10.15845/bryggen.v20.

Palumbo, A. 2020. *Skriftsystem i förändring: En grafematisk studie av de svenska medeltida runinskrifterna*. Runrön 23. Uppsala: Institutionen för nordiska språk vid Uppsala universitet. Retrieved from: http://www.diva-portal.org/smash/record.jsf?pid=diva2:1509013&dswid=-3719.

Parsons, D. N. 2002. Anna, Dot, Thorir ... counting Domesday personal names. *Nomina: A Journal of Name Studies Relating to Great Britain and Ireland* 25, 29-49. Retrieved from: http://www.snsbi.org.uk/Nomina.html.

Paysan, M. & K. Düwel 2020. Runeninschriften und deren mögliche Veränderung durch Freilegungstechniken und Konservierungsüberzüge. *In*: K. Düwel, R. Nedoma & S. Oehrl, eds. *Die südgermanischen Runeninschriften*. Ergänzung zum Reallexikon der Germanischen Altertumskunde 119. Berlin, Boston: Walter de Gruyter, CLXXVIII-CLXXXIV. DOI: 10.1515/9783110533187.

Peterson, L. 1994. "Scandinavian Runic-Text Data Base: a Presentation". *In*: B. Ambrosiani & H. Clarke, eds. *Developments around the Baltic and the North Sea in the Viking Age*. Vol. 3. Birka studies. Viking Congress. Stockholm: Birka project for Riksantikvarieämbetet and Statens Historiska Museer, 305-309.

Peterson, L. 2004. *Lexikon över urnordiska personnamn*. Uppsala: Institutet för språk och folkminnen.

Peterson, L. 2007. *Nordiskt runnamnslexikon*. 5th ed. Uppsala: Institutet för språk och folkminnen.

Projekt RuneS October 2018. Retrieved from: http://www.runesdb.de/home (accessed 16th December 2020).

Ramsay, S. 2004. Databases. *In*: J. Unsworth, R. G. Siemens & S. Schreibman, eds. *A Companion to Digital Humanities*. Blackwell companions to literature and culture 26. Malden, MA: Blackwell Publishing Ltd, 177-197. DOI: 10.1002/9780470999875.

Runenprojekt Kiel 2016a. *Das Kieler Runenprojekt* (KRDB). Retrieved from: http://www.runenprojekt.uni-kiel.de/beschreibung/1/default.htm (accessed 8th October 2018).

Runenprojekt Kiel 2016b. *Datenbankabfragen*. Retrieved from: http://www.runenprojekt.uni-kiel.de/abfragen/default.htm (accessed 8th October 2018).

Runenprojekt Kiel 2016c. *Datenbankstruktur*. Retrieved from: http://www.runenprojekt.uni-kiel.de/beschreibung/2/default.htm (accessed 8th October 2018).

Runenprojekt Kiel 2016d. *Die Literaturdatei*. Retrieved from: http://www.runenprojekt.uni-kiel.de/beschreibung/6/default.htm (accessed 8th October 2018).

Runenprojekt Kiel 2016e. *Queries*. Retrieved from: http://www.runenprojekt.uni-kiel.de/abfragen/default_eng.htm (accessed 8th October 2018).

Runenprojekt Kiel 2016f. *The Kiel Rune Project (Kieler Runenprojekt)*. Retrieved from: http://www.runenprojekt.uni-kiel.de/beschreibung/1/default_eng.htm (accessed 8th October 2018).

Runenprojekt Kiel October 2016g. *The table Find*. Retrieved from: http://www.runenprojekt.uni-kiel.de/beschreibung/3/default_eng.htm (accessed 8th October 2018).

Runenprojekt Kiel 2016h. *The table Interpretations*. Retrieved from: http://www.runenprojekt.uni-kiel.de/beschreibung/4/default_eng.htm (accessed 8th October 2018).

RuneType 2002 October 2002. *RuneType. The Rune Typology Project* (RuneType 2002). Retrieved from: https://www.nb.no/baser/runer/RB.html (accessed 8th October 2018).

Runic inscriptions from Bryggen in Bergen 2002. Retrieved from: https://www.nb.no/baser/runer/eindex.html (accessed 15th October 2018).

Runor n.d. Retrieved from: https://app.raa.se/open/runor/search.

Schmidt, T. 2002. Fornavn i Norge gjennom 1000 år. *In*: K. Sprauten, ed. *Å kallast med sitt rette namn*. Oslo: Norsk lokalhistorisk institutt, 88-114.

Schreibman, S., R. G. Siemens & J. Unsworth 2004. The Digital Humanities and Humanities Computing: An Introduction. *In*: J. Unsworth, R. G. Siemens & S. Schreibman, eds. *A Companion to Digital Humanities*. Blackwell companions to literature and culture 26. Malden, MA: Blackwell Publishing Ltd, xxii-xxvii. DOI: 10.1002/9780470999875.

Seim, K. F. 1982. *Grafematisk analyse av en del runeinnskrifter fra Bryggen i Bergen*. MA thesis. Universitetet i Bergen.

Seim, K. F. 1988. A Review of the Runic Material. *In*: A. E. Herteig, ed. *The Bryggen Papers. Supplementary Series No 2*. The Bryggen Papers. Supplementary Series 2. Bergen: Norwegian University Press, 10-23. DOI: https://doi.org/10.15845/bryggen.v2Suppl..

Seim, K. F. 1989. Runeinnskrifter fra Trondheim og Bergen som kilder til Islandshandelens historie? Et innfløkt proveniens-spørsmål. *Historisk Tidsskrift* 68, 333-347.

Seim, K. F. 1991. Flere onomastiske sider ved runematerialet fra bygrunnen i Trondheim og Bryggen i Bergen. *Studia Anthroponymica Scandinavica* 9, 21-32.

Seim, K. F. 1998. *De vestnordiske futhark-innskriftene fra vikingtid og middelalder – form og funksjon*. PhD thesis. NTNU Trondheim. Det historisk-filosofiske fakultet. Institutt for nordistikk og litteraturvitenskap.

Seim, K. F. 2013. Runologi. *In*: O. E. Haugen, ed. *Handbok i norrøn filologi*. 2nd ed. Bergen: Fagbokforlaget, 128-193.

Shaw, P. A. 2011. The Role of Gender in Some Viking-Age Innovations in Personal Naming. *Viking and Medieval Scandinavia* 7.7, 151-170. DOI: 10.1484/J.VMS.1.102620.

Simek, R. & H. Pálsson 2007. *Lexikon der altnordischen Literatur*. Stuttgart: Alfred Kröner Verlag.

Sirkin, R. M. 2006. *Statistics for the social sciences*. 3rd ed. Thousand Oaks, California, London: Sage.

Sørlie, M. 1950. *Norske språkminner i engelske tollregnskaper fra 1300-årene*. Universitetet i Bergen Årbok 1948: Historisk-antikvarisk rekke 3. Bergen: Universitetet i Bergen.

Spurkland, T. 1991. *En fonografematisk analyse av runematerialet fra Bryggen i Bergen*. PhD thesis. Institutt for nordistikk og litteraturvitenskap, Institutt for arkeologi, kunsthistorie og numismatikk, Universitetet i Oslo.

Spurkland, T. 2005. *Norwegian runes and runic inscriptions*. Trans. by B. van der Hoek. Woodbridge: Boydell & Brewer.

Stefani, E. de 2016. Names and Discourse. *In*: C. Hough & D. Izdebska, eds. *The Oxford Handbook of Names and Naming*. Oxford handbooks in linguistics. Oxford: Oxford University Press, 52-66.

Stemshaug, O. 1982a. Førreformatoriske namn. *In*: O. Stemshaug, ed. *Norsk personnamnleksikon*. Oslo: Det norske Samlaget, 32-43.

Stemshaug, O. 1982b. Namngjeving og namnebruk. Namngjevingsmåtar. *In*: O. Stemshaug, ed. *Norsk personnamnleksikon*. Oslo: Det norske Samlaget, 25-31.

Tanner, S., L. Gibson, R. Kahn & G. Laycock 2016. Choices in Digitisation for the Digital Humanities. *In*: M. Hayler & G. Griffin, eds. *Research methods for creating and curating data in the digital humanities*. Research methods for the arts and humanities. Edinburgh: Edinburgh University Press, 14-43.

TEI: P5 Guidelines 2020. Retrieved from: https://tei-c.org/guidelines/p5/.

Thompson, C. W. 1981. "On transcribing runic inscriptions". *In*: C. W. Thompson, ed. *Proceedings of the First International Symposium on Runes and Runic Inscriptions*. Michigan Germanic Studies VII. Ann Arbor, Michigan: Department of Germanic Languages and Literatures, The University of Michigan, 89-97.

Unsworth, J., R. G. Siemens & S. Schreibman, eds. January 2004. *A Companion to Digital Humanities*. Blackwell companions to literature and culture 26. Malden, MA: Blackwell Publishing Ltd. DOI: 10.1002/9780470999875.

Uppsala runforum 2014. *Samnordisk runtextdatabas (application)* (Rundatabas). Retrieved from: http://www.nordiska.uu.se/forskn/samnord.htm (accessed 5th October 2018).

Uppsala runforum 2018. *Samnordisk runtextdatabas*. Retrieved from: http://www.runforum.nordiska.uu.se/srd/ (accessed 5th October 2018).

velcrow 2018. *Simple way to calculate median with MySQL*. Retrieved from: https://stackoverflow.com/a/7263925 (accessed 13th August 2018).

w3schools 2020. *SQL Quick Reference*. Retrieved from: https://www.w3schools.com/sql/sql_quickref.asp (accessed 14th December 2020).

Waldispühl, M. 2013. *Schreibpraktiken und Schriftwissen in südgermanischen Runeninschriften*. Medienwandel - Medienwechsel - Medienwissen 26. Zürich: Chronos.

West, A. n.d.(a). *BabelMap (Unicode Character Map for Windows)* (Babelmap). Retrieved from: http://www.babelstone.co.uk/Software/BabelMap.html.

West, A. n.d.(b). *BabelStone Shapes*. Retrieved from: http://www.babelstone.co.uk/Fonts/Shapes.html.

Whaley, D. 1993. Nicknames and Narratives in the Sagas. *Arkiv för Nordisk Filologi* 108, 122-146.

Wieske, N. 2011. *Kommerzielle Revolution in Norwegen und Island? Intraregionaler Handel im Spiegel altwestnordischer Quellen*. München: Utz.

Wills, T. 2013. Relational data modelling of textual corpora: The Skaldic Project and its extensions. *Digital Scholarship in the Humanities* 30.2, 294-313. DOI: 10.1093/llc/fqt045.

Zilmer, K. 2020. Runic sticks and other inscribed objects from medieval Bergen: Challenges and possibilities. *Maal og Minne* [112]/1, 65-101.

Glossary

1:1-relationship one-to-one relationship. 62, 295, 296

1:N-relationship one-to-many relationship. 62, 65, 67, 296, 297

alliteration repetition of the initial letter or sound of a word in a second word/idionym. 78, 79

alphabetic using an alphabet. 37

Altbase entity type in the original UMB DB storing all information on finds. 150, 162, 164

alternative hypothesis hypothesis formulated in opposition to H_0, usually stating that H_0 is wrong. 91, 92, 295, 297, 298, *see* H_0 & inferential statistics

anthroponym name given to a human being. 75, 77, *see* idionym

attribute a particular feature of an object/data item, shared by all entities in one entity type. 23, 55, 56, 60, 62, 64, 66, 68, 69, 71, 72, 98, 130, 134, 259, 295, 298, 300

bibtexkey refers to the unique PK used in .bib-databases to identify a bibliographic reference. 101

bind-rune runic ligatures. 40, 50, 51, 70, 71

Bjǫrgvin medieval name used for Bergen. Within the context of this project, its use indicates a reference to the medieval rather than the modern town. 13, 74, 75, 77, 79–85, 98, 109, 111–121, 124, 125, 127–129, 133, 138–140, 142–145, 147, 149, 159, 162, 164, 165, 167–169, 174, 175, 180, 181, 184, 188, 189, 192, 199, 201, 202, 208–210

BOOLEAN 0 or 1, true or false, electronically ON or OFF. 61, 70, 71, 73, 98, 102, 103, 130, 160

bootstrapping a resampling method during which samples are taken from samples, which are then used for the actual testing. 91, 92

building phase building activities taking place during one period. 159–162, 165–168, 271, 272

CES Character Encoding Standard. 23, 24, 42–44, 47, 48, 300

character encoding in digital systems, characters must be represented numerically. A character encoding assigns numbers to characters. Different encoding systems exist. 22, 23, 37, 42, 44, 46, 53, 57, 68, 293, 300, *see* UTF-8

Character Encoding Standard official guideline, often issued by an association in charge of such norms (e.g. the Unicode consortium) on how a set of characters is to be translated into/represented by means of code. 23, 24, 42–44, 47, 48, 293, 300, *see* character encoding & UTF-8

CONEVAL entity type in the archaeological DB. 158

CONFIRE JOIN in the archaeological DB, connecting FIRE and CONTEXTS. 160, 161, 164

CONLAYER entity type in the archaeological DB. 157, 158, 160, 269

CONPHASE JOIN in the archaeological DB, connecting PHASES and CONTEXTS. 160, 161, 165

CONSTRUC JOIN in the archaeological DB, connecting STRUCTURES and CONTEXTS. 153, 154, 156, 158, 267, 280

CONTEXTS entity type in the archaeological DB. 153, 154, 156, 157, 160, 162, 293, 294

CONUNIT JOIN in the archaeological DB, connecting EXCAVUNIT and CONTEXTS. 154, 156, 158, 169, 269

core database the absolute minimum of tables required to properly model runological data within this project. 14, 97, 105, 210, 297–299, *see* TAKERUN

.csv Comma Separated Values, files that contain database fields separated by commas. 22, 23

data normalisation a feature of an object or conceptual item, stored in fields in DBs. 25, 27, 30, 34, 129, 131, 147, 158, 164

database structured collection of related, logically coherent data in digital form, usually accessible, curated and maintained via a DBMS. 13–21, 23–25, 27, 30–35, 37–39, 44, 45, 48, 50, 52, 54–74, 97, 105, 107, 129–131, 135, 148, 150, 152, 153, 156, 158, 160, 162, 164, 165, 208, 210, 211, 250, 293–301

Database Management System a collection of computer applications/programmes designed to allow users to define, access and interact with the information contained in a DB. Various DBMS based on different principles on managing data are available, e.g. RDBMS. 16, 17, 19–21, 23, 30, 31, 36, 44, 56, 61, 64, 294, 299, *see* DB

DB database. 13–21, 23–25, 27, 30–35, 37–39, 44, 45, 48, 50, 52, 54–74, 97, 105, 107, 129–131, 135, 148, 150, 152, 153, 156, 158, 160, 162, 164, 165, 208, 210, 211, 250, 293–301

DBMS Database Management System. 16, 17, 19–21, 23, 30, 31, 36, 44, 56, 61, 64, 294

decimal column type in SQL-based DBs, meant to store positive or negative decimal values. 156

descriptive statistics blanket term for different methods of describing properties of observed data. 91, 296, 298

deuterotheme second element in a dithematic name. 78

DISTINCT SQL-clause in SELECT-statements used to narrow down result sets to return only rows containing different entries. All entries where the character sequences are copies of each other are dropped.. 67, 106, 153, 250, 271, 273

dithematic consisting of two nouns, or one noun and one adjective. 77, 78, 116, 294

entity an object, real or conceptual. 17, 25, 55–59, 61, 62, 64, 68, 69, 97, 135, 136, 138, 145, 148, 293, 296–298

entity model theoretical description of how a DB will be constructed; entity modelling is the process by which all entity types and the relationships between them are identified. 25, 30, 31, 56, 57, 59, 60, 62, 67, 76, 97, 99, 101, 105, 106, 131, 135–137, 150, 151, 210, 211

entity type groups/sets/classes of entities which share common attributes, for example transliterations. 17, 19, 24–27, 30, 36, 55–57, 59, 60, 62, 64, 65, 67–69, 72–74, 97, 101, 103, 130, 134–137, 150, 152, 153, 156–159, 162, 164, 271, 293–300

EXCAVUNIT entity type in the archaeological DB, designed to contain information about the excavation units used during BRM 0000. 152, 156, 294, 299

FIRE entity type in the archaeological DB. 159–161, 293

FK foreign key. 58, 61–63, 65–67, 69–71, 73, 97, 101, 134, 136, 160, 162, 259, 295, 296

font also called typeface, the delivery mechanism of the font design. 40–48, 50, 51, 100, 295

foreign key a primary key becomes a foreign key once entered in a relation/table other than the original one. Strictly speaking, a FK is an attribute in a relation/table whose values are functionally dependent on the values in the PK of another relation. They serve as link between different relations in RDBMS; most often, it is therefore possible for foreign keys to appear several times in another table, except when there is a 1:1-relationship. 58, 61–63, 65–67, 69–71, 73, 97, 101, 134, 136, 160, 162, 259, 295, 296, 298, *see* PK

Futhark expression used by runologists for runic "alphabets", see Section 3.1. 13, 25, 27, 37–39, 41, 44–46, 48, 52, 126, 136, 210, 295

.gpx GPS exchange format files, allows for exchange of GPS data between applications/users. 23

grapheme-phoneme relationship description of how grapheme and phoneme relate to each other. 51, 53

grapheme minimal unit of a writing system. 37, 295

Graphical User Interface graphical application allowing users to interact with computers, for example the desktop environment. 16, 20, 21, 25, 28–32, 42, 51, 250, 283, 295

GUI Graphical User Interface. 16, 20, 21, 25, 28–32, 42, 51, 250, 283

Gullhornet font created by Odd Einar Haugen for the Norwegian runic inscriptions in Older Futhark. 44, 46

Gullskoen font created by Odd Einar Haugen for the Norwegian runic inscriptions in Younger Futhark. 41, 44, 46, 47, 49

H_0 null hypothesis. 91–93, 109, 110, 113, 114, 116, 118, 120, 293, 295, 298

H_1 alternative hypothesis. 91, 92, 297, 298

hypocorism short/pet form of a name. 76, 77, 82, 83

idionym personal name (PN), also a table in TAKERUN, and a column therein. 61, 66, 71, 75–95, 97, 98, 100–103, 105–124, 126, 127, 131, 135, 136, 138–147, 160, 164, 166–206, 208–210, 240–258, 262, 264, 265, 271–280, 293, 295–298, *see* IDIONYM

IDIONYM entity type in TAKERUN and a column in that relation, storing idionyms. 64–66, 91, 101–103, 106, 107, 119, 210, 240–250, 252, 257, 258, 271, 279

inferential statistics blanket term for differents methods of analysing a population/sample and inferring properties thereof based on the results, which are often gained by testing different H_0. 91, 296, 297

inscription used here to describe all sequences of runes on a particular object, whether or not they consists of more than one textual entity, also an entity type in TAKERUN. 58, 72, 135, 298, 300, *see* core database

INSCRIPTION entity type in TAKERUN. 65–70, 135, 250, 259, 271, *see* inscription

INSCRIPTIONNAMES entity type in the onomastic research database of TAKERUN, storing all character sequences which can be identified as idionyms. 97, 98, 100, 101, 103, 106, 107, 271, 297

integer column type in SQL-based DBs, meant to store positive or negative integer values. 156

JOIN as a table, it prevents N:M-relationship in a RDBMS by resolving the N:M-relationship to two 1:1-relationships or 1:N-relationships. As a SQL-clause of SELECT-statements, it is used to combine data from two or more relations/tables based on the values of (related) attributes (often in the form of PKs and FKs). JOIN must be further defined by LEFT, RIGHT, INNER, FULL, each of which triggers a specific kind of joining operation, leading to differen result sets. 25, 62–65, 68, 100, 101, 106, 134, 156, 160, 164, 271, 293, 294, 296, 297, 299, 300

KDB Kieler Runendatenbank. 20, 25–28, 30–34, 36, 55, 56, 59, 74, 210, 299

Kieler Runendatenbank runic DB, dating to 1995-1999, Section 2.2.3. 20, 25–28, 30–34, 36, 55, 56, 59, 74, 210, 296, 299

Kontekstbase entity type in the original UMB DB storing all information on contexts. 150, 153, 156, 157

χ^2-test tool from inferential statistics, used to determine whether there is statistical dependance between two samples, often of quite different sizes. 8, 84, 90–94, 107, 109, 111, 113–116, 120, 124, 138, 171, 209, 244–249, 254–256, 279

many-to-many relationship describes relationships in which more than one entity from one relation relates to more than one entity from another. N:M-relationships cannot be directly represented in a RDBMS – they have to be represented as two 1:N-relationships or 1:1-relationships. 62, 97, 101, 296, *see* JOIN

mean tool from descriptive statistics, employed to determine the average value within a sample. 93, 94, 254, 255, 279

median tool from descriptive statistics, employed to determine the value which cuts off the upper 50% of a sample from the lower 50%. 93, 94, 112, 114, 116, 120, 123, 254, 255, 279

Medieval Nordic Text Archive online repository of manuscripts written in OWN and Latin dating to the Middle Ages. 26, 42, 211, 296

MENOTA Medieval Nordic Text Archive. 26, 42, 211

monothematic consisting of one noun or adjective. 77, 78

N:M-relationship many-to-many relationship. 62, 97, 101, 296

name transfer giving a child the full name of a family member without varying any part of it. 78, 79, 83, 87, 93, 111, 124, 209

NAMEJOIN JOIN table ensuring 1:N-relationships between INSCRIPTIONNAMES and idionym. 101, 103, 271

normalisation result of applying ortographic rules for a specific language, e.g. Latin or OWN, to a sequence of letters or runes, also an entity type in TAKERUN. 13, 20, 21, 25, 31, 33, 34, 36, 39, 55, 56, 59, 60, 67, 72, 73, 82, 103, 106–108, 114, 129, 135–137, 140–142, 164, 167, 169, 171, 176, 181, 188, 189, 192, 195, 213, 240–243, 259, 275, 297, 298, *see* NORMALISATION

NORMALISATION entity type in the core database of TAKERUN storing normalisations. 67, 72, 73, 135, 136, 164, 261, 279

NULL can be used as a default value in RDBMS to indicate that a cell contains nothing. Cannot be expressed or searched for by using 0, which in most systems is considered a numeral. 69, 70, 91, 102, 114, 256, 276

null hypothesis hypothesis stating that there is no correlation between two measured observations/phenomena. Inferential statistics provide different testing methods to determine whether H_0 can be accepted or rejected, in which latter case the H_1 is generally accepted as the new working hypothesis. 91–93, 109, 110, 113, 114, 116, 118, 120, 293, 295, 298, *see* H_1

OBJECT entity type in the archaeological DB. 162, 163

OBJECTCLASSIFICATION entity type in the archaeological DB. 163, 164

OBJECTEXTRAS entity type in the archaeological DB. 163, 164

OBJECTIDENTIFICATION entity type in the archaeological DB. 163, 164

OBJECTMATERIAL entity type in the archaeological DB. 163, 164

Old West Norse Language spoken in medieval Scandinavia, also a column designation in PATTERNING in TAKERUN. 21, 37, 52, 59, 61, 71, 75–77, 80, 81, 83–85, 102, 103, 108, 111, 124, 126, 128, 135, 136, 188, 199, 209, 210, 240–243, 296, 297

one-to-many relationship describes a relationship where one entity from one entity type relates to one or more items from another group. One of two types of relationship required for the smooth functioning of a RDBMS. 62, 65, 67, 293, 296, 297, *see* 1:1-relationship

one-to-one relationship describes a relationship where one entity from one relation (table, often an entity type) relates to one item from another. One of two types of relationship required for the smooth functioning of a RDBMS. 62, 293, 295–297, *see* 1:N-relationship

onomastics the study of names and naming. 75, 83

operating system underlying system software managing hardware and software in a computer and providing services to users; well-known examples are Microsoft Windows or Ubuntu Linux. 20, 27, 297, 300

OS operating system. 20, 27, 300

OWN Old West Norse. 21, 37, 52, 59, 61, 71, 75–77, 80, 81, 83–85, 102, 103, 108, 111, 124, 126, 128, 135, 136, 188, 199, 209, 210, 240–243, 296, 297

owner's tag wooden object, often in the form of an arrow or with a hole, by which means it could be fastenen to wares of different types. 116, 126, 129, 131, 133, 138–144, 164, 165, 167, 169, 172, 174–176, 179, 180, 182–184, 188–192, 195, 197, 198, 202

p-value probability value. 91–93, 116, 244–249, 257

patterning process of looking for patterns (words, sentences etc.) in a sequences of characters in a runic inscription, leading to a transliteration or normalisation; also an entity type in the core database. 59, 60, 71, 72, 135, 137, *see* PATTERNING

PATTERNING entity type in the core database, in which scholarly considerations of a transrunification/transliteration are stored. 61, 66, 67, 71–73, 97, 98, 100, 101, 106, 130, 135, 136, 210, 250, 261, 279, 297, *see* TAKERUN

period time span between two fires/fire layers. 149, 158–162, 165–198, 200, 202–210, 269–276, 280, 293

personal name also referred to as "given/Christian/first name" or idionym, generally designates the unique identifier of a human being used in interaction. 75, 76, 78, 80, 84, 88, 90, 97, 98, 101, 106–108, 114, 115, 124, 131, 138–144, 167, 174, 179, 182, 183, 190, 191, 197, 202, 206, 208, 210, 252, 272, 295, 298, *see* anthroponym

PHASES entity type in the archaeological DB. 160–162, 271, 293, 299

phoneme a minimal unit of speech carrying mea ning, speech sound. 37, 51, 52, 295

phonemic using the distinctive speech elements of a language. 37

PK primary key. 21, 23–25, 27, 58, 61–66, 68–70, 73, 97, 100–103, 106, 130, 136, 150, 152, 153, 156, 159, 160, 162, 293, 295, 296

PN personal name. 75, 76, 78, 80, 84, 88, 90, 97, 98, 101, 106–108, 114, 115, 121, 124, 131, 138–144, 167, 174, 179, 182, 183, 190, 191, 197, 202, 206, 208, 210, 252, 272, 295

primary key an attribute or combination of attributes whose values uniquely identify each record (entity) in a relation/table. 21, 23–25, 27, 58, 61–66, 68–70, 73, 97, 100–103, 106, 130, 136, 150, 152, 153, 156, 159, 160, 162, 293, 295, 296, 298, *see* FK

probability value used to determine how likely test results are to occur provided H_0 is correct and the sample is chosen well, the result therefore statistically significant. Common thresholds for p are 1% (.01) or 5% (.05). Test results below the chosen threshold confirm H_0, results above p confirm H_1. 91–93, 116, 244–249, 257, 298

quartile tool from descriptive statistics, employed to split a list of items up into four equal parts (25%, 50%, 75%, 100% of all items). 94, 95, 97, 112–121, 123, 124, 142, 180, 201, 209, 244–249, 254, 279, *see* median

R for statistical computing computer application developed for statistics. 92, 298

R R for statistical computing. 92

RC replacement character. 100, 101, 301

RDBMS Relational Database Management System. 16–19, 21, 23, 25, 27, 30, 32–34, 54–56, 58, 60–64, 66, 67, 69, 72, 75, 89, 97, 105–107, 124, 130, 137, 147, 207, 208, 210, 211, 257, 294–297, 299, 301

Relational Database Management System data represented in a collection of relations which resemble tables. The relational model has a more formal mathematical foundation than other models. 16–19, 21, 23, 25, 27, 30, 32–34, 54–56, 58, 60–64, 66, 67, 69, 72, 75, 89, 97, 105–107, 124, 130, 137, 147, 207, 208, 210, 211, 257, 294–297, 299, 301, *see* DBMS

replacement character A character used to symbolise another, non-displayable character, for example a rune variation not coded in Unicode. Since Unicode version number, a bespoke replacement character exists at code point U+FFFD. 100, 101, 298, 301

research database additional sections building on the core database in order to answer specific research questions. 14, 64, 97, 101, 103–105, 135–137, 158, 164, 210, 296, 299

RFB Runer fra Bryggen. 20, 30–34, 36, 37, 55, 210

.rtf Rich Text Files, files containing formatted text (like bold, italic, underlined, colours). 23

Rundatabas Samnordisk Runtextdatabas. 18, 20–27, 31–34, 36, 40, 55–57, 59, 67, 71, 97, 137, 211, 283, 299

rune row individual character sets of runes, see Section 3.1. 38, 45, 48, 52, 59

Runer fra Bryggen runic DB specifically focused on the Bergen inscriptions, dating to 1993, Section 2.2.5. 20, 30–34, 36, 37, 55, 210, 299

RunesDB online platform based on data from KDB, but with new underlying technology. 20, 28–30, 36

Runor online platform based on the new relational version of Rundatabas. 24, 25, 27, 36, 58, 82, 211, 213–229

Samnordisk Runtextdatabas first runic DB, dating to 1987/1993, Section 2.2.1. 18, 20–27, 31–34, 36, 40, 55–57, 59, 67, 71, 97, 137, 211, 283, 299

SEQUENCES JOIN-entity type in TAKERUN. 65, 100, 101, 103

.shp Shapefile, file type used in GIS or digital design applications. 23

SQL Structured Query Language. 17, 60, 61, 64, 66, 73, 91, 101, 165, 250, 255, 257, 279, 294, 296, 300

STRUCPHASE JOIN in the archaeological DB, connecting STRUCTURES and PHASES. 162

Structured Query Language computer language used to define and manipulate data and structures in RDBMS. 17, 60, 61, 64, 66, 73, 91, 101, 165, 250, 255, 257, 279, 294, 296, 299, 300

STRUCTURES entity type in the archaeological DB. 153, 294, 299

STRUCUNIT JOIN in the archaeologic al DB, connecting STRUCTURES and EXCAVUNIT. 154

Take Runes relational DB developed over the course of this project, consisting of a core database encompassing the most basic and important information required by runologists, and additional research databases. 14, 68, 71, 73, 97, 103, 105–107, 127, 130, 131, 134–137, 146, 150, 151, 159, 162, 164, 202, 210, 211, 213–229, 250, 254, 257, 279, 294–300

TAKERUN Take Runes. 14, 68, 71, 73, 97, 103, 105–107, 127, 130, 131, 134–137, 146, 150, 151, 159, 162, 164, 202, 210, 211, 213–229, 250, 254, 257, 279, 295–297, 299, 300

tally stick wooden stick used to help keep count of items by carving notches. 172, 174, 190, 202

TEXTS entity type in TAKERUN representing the shift from inscription as a physical entity in the form of one object to the abstract entity of a coherent, meaningful text. 134–138, 145, 300, *see* text

TEXTTAGS JOIN-table in TAKERUN connecting TEXTS to TTAGS. 134, 135, 259

toponym place name. 75, 84

transliteration result of turning runes into Latin letters, also an entity type in TAKERUN. 13, 17, 18, 20, 21, 25, 30, 31, 33, 34, 36, 39, 40, 46, 49, 51–56, 59, 60, 62, 67, 68, 70, 71, 73, 82, 97, 98, 100, 101, 103, 135, 137, 146, 150, 164, 192, 213, 294, 298, 300, *see* TRANSLITERATION

TRANSLITERATION entity type in TAKERUN storing transliterations. 65, 70–73, 99, 106, 135, 164, 259

transrunification process of transcribing runes as observed on an item into normalised runes, either manually or using a computer. Also an entity type in TAKERUN. 13, 20, 31, 36, 39–41, 47, 50–55, 57–62, 67, 69–71, 73, 97, 100, 146, 300, *see*

TTAGS entity type in TAKERUN storing all labels referring to the type, content, purpose, carver and situational context of a text. 130–132, 134, 136, 259, 300

.txt files storing unformatted generic text contents. 23

UNION SQL-command used to combine the results of two queries into one result sets; the number of columns and their field types must match up for this to work.. 136, 261

UNIRUNES entity type in TAKERUN containing transrunifications using a bespoke CES. 57, 69, 70, 73, 135, 136

UTF-32 character encoding issued by the Unicode consortium. 42, *see* UTF-8

UTF-8 character encoding issued by the Unicode consortium using 1-4 8-bit bytes to encode a total of 1,112,064 characters. Default character encoding on most Linux OS. 23, 24, 42, 44

Vagantenlyrik poetry/songs written by and popular with students and scholars at medieval European universities. 126–129

varchar column type in SQL-based DBs, meant to store characters of any sort. 156

variation using parts of family members' names to create a new name for a child. 77–79, *see* dithematic

VIEW virtual table with rows and columns based on the result-set of an SQL-statement. 30, 106, 138, 165, 257, 263, 264, 268, 270, 271, 274, 277, 279, 280

Wenderune a rune turned upside-down or right-to-left compared to its "ideal" orientation. 41, 42, 45, 47, 51, 53, 54

WHERE SQL-command/query modifier used to narrow down search results based on attribute values. 66, 107, 205, 250, 252, 254–256, 259, 265, 268, 269, 271–273, 276

wildcard system-dependant character used as a RC in cases where the DB-user is uncertain of the actual character in this position. Commonly used wildcard characters in RDBMS are _, % or *. 23, 31, 66, 67, 271, 273

THE BRYGGEN PAPERS

Main Series No. 10

This volume of The Bryggen Papers focuses on the almost 700 runic inscriptions found over the course of the Bryggen excavations (1955–1979) in Bergen, Norway. Rather than being a more traditional study of the content of the inscriptions, it assesses relational database management systems as a tool for conducting runological research and makes use of the digital format by directly linking to other runic databases to supplement the information provided here. In doing so, this volume aims to demonstrate the utility of this approach of data management in analysing other corpora of runic inscriptions, as well as furthering understanding of the Bergen examples.

The medieval inhabitants of Bergen inscribed runes onto a variety of materials: wooden sticks, bones, ceramics and even leather shoes. The topics they wrote about varied, ranging from religious invocations to vulgar descriptions of their fellow townspeople. Nor were these inscriptions static; it is possible to identify trends in the way inscriptions changed over time with the development of the medieval settlement, influenced by concurrent historical events. Information as to the potential geographic origins and social status of some of the carvers, who saw fit to record their names, can also be derived from the inscriptions.

The interdisciplinary study exemplifies how the theoretical framework of relational databases can be utilised to support in-depth comparisons of runic inscriptions. It is hoped that the approach demonstrated here will find wider application within the broader field of runology and epigraphic studies in general.

The author

Elisabeth Maria Magin, PhD (b. 1987) has a Bachelor's and Master's degree in Proto- and Prehistoric Archaeology and Scandinavian Philology from the Georg-August-Universität Göttingen, Germany, and received her doctoral degree for her interdisciplinary thesis on the runic inscriptions from Bryggen at the School of English, University of Nottingham. She has taught Old Norse, medieval Scandinavian literature and runology at the universities of Bergen and Oslo, and worked for several years as an assistant on the edition of South Germanic runic inscriptions published in 2020. She is currently undertaking a Marie Curie-Skłodowska Actions-funded project aiming to create the infrastructure for digital editions of runic inscriptions at the Museum of Cultural History, Oslo.

ISBN: 978-82-93904-02-1 (online)
ISSN: ISSN 2704-0682 (online)
DOI: doi.org/10.15845/bryggen.v100