

**Between a Rune Stone and a Hard Place:
Deconstructing Mass Media Influence on Knowledge Production in Viking
Age Archaeogenetic Publications**

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Abstract

The archaeological traditions of the Viking Age have a complex history. Some of it has been nationalist in orientation, at times constructing proud historical narratives reflecting ownership in and continuity of the past. These narratives conflict with increasing population diversity in the Scandinavian nations, where contemporary identity politics grapple with real and imagined realities of immigration, ethnicity, and origin. Within this complex climate of public and political debate, archaeology, now bolstered by ancient genetic data, is often deployed. Ancient DNA studies on Viking Age mobility are forcing ideologically polarized stakeholder groups to reconsider their perceptions of Nordic identity both past and present.

This creates an opportunity to investigate the relationship between science, mass media, and diverse publics as the nature of knowledge production and communication changes. The historically dominant mode of knowledge dissemination has been a linear, one-way model of simplification from the “expert” source of production to a generalized public to then consume. This thesis takes a different approach borrowed from science and technology studies, deemed medialization, in which knowledge is produced through an integrated, reciprocal relationship between research institutions, public consumers, and the media. This thesis investigates this medialization, evaluating knowledge production and translation in a meta-analysis of three archaeogenetic case studies that focus on Viking Age population genomics and migration.

It concludes that medialization alone is not a sufficient enough lens with which to clarify the relationship between science, its stakeholders, politics, and the mass media that ties them all together. This relationship varies case by case in which institutions and individual researchers cannot be absolved of responsibility when research is not communicated with integrity or press releases are not vetted for misinformation. This research is indicative of a likely paradigm shift in Viking studies. The current political climate and use of new aDNA data is broadening the definition of Viking identity. This situates it in a polarized public and political discourse to suit a more diverse, globalized Scandinavia to the support of some, and disapproval of others. This medialization, while inevitable, is not inherently reductive. Scientific knowledge production and communication is changing. The relationship that archaeologists and research institutions have with media, society, and politics must also change accordingly.

Chapter 1. Introduction

“Blonde Scandinavians or well-traveled Southern Europeans? New research busts myths about Vikings” (Copenhagen University, 2020).

This is the headline for Copenhagen University’s press release for Margaryan et al.’s 2020 paper in *Nature* titled “Populations Genomics of the Viking World”. This article made waves in academic and public spheres alike, accessed over thirty-five thousand times since its publication. The last decade has seen numerous Viking Age research publications utilizing archaeological science techniques such as ancient DNA (aDNA) analysis and stable isotope analysis (SIA). Stakeholders in a multitude of publics have a vested interest in this research not only due to the Viking caricature as one saturated in nationalistic and popular imagination but also due to the trust put in genomic data as a way of generating scientific “truth” and for shaping identity both past and present (Crellin and Harris, 2020; Hilgartner, 2012; Lund and Sindbæk, 2021; Sindbæk, 2022; Stand and Källén, 2021; Rödder, 2009). The relationship between archaeological knowledge and its dissemination to its public and political stakeholders is longstanding. The nature of this relationship, however, is changing as the production of archaeological knowledge is influenced by multidisciplinary collaboration and increasing media attention.

This dilemma is by no means exclusive to archaeology and archaeogenetics. The production of scientific knowledge across disciplines has faced increasing media attention in the last few decades generating a reciprocal relationship in which science has increasingly oriented itself to the media. Science and technology studies (STS) has dubbed this process *medialization* (Weingart, 1998; see also Franzen et al., 2012; Hilgartner, 2012; Rödder, 2009). Archaeogenetics and the production of archaeological knowledge is no exception to this medialization. Rather, archaeology has been intimately tied to various forms of media as a valuable field for public and political stakeholders since its inception as a discipline (Alberti, 2006, p. 407; Brumfiel, 2006, p. 31; Hackenbeck, 2019; McGuire, 2008; Sørensen, 2013).

Much of the current STS scholarship on medialization has not considered fields within the social sciences or humanities and has instead focused on other “high visibility” fields such as genomics. Archaeology, especially in the wake of Kristiansen’s (2014) identification of a Third Science Revolution, provides an opportunity to examine medialization in the humanities as the application of scientific techniques to answer archaeological questions is becoming ever more commonplace. It is at this intersection that the use of archaeological science techniques in research on the Viking Age proves to be particularly fruitful. The themes often addressed in such research, including ethnic identity, origin of past peoples, and migration are of vested importance in academic, public, and political spheres alike (e.g. Crellin and Harris 2020; Hakenbeck, 2019; Panofsky and Donovan, 2019, Källén and Strand, 2019).

A small number of archaeogenetic publications have undergone analysis regarding medialization by Källén et al. (2019). However, Källén and colleagues investigated smaller scale, more sensational studies. They focused on their case studies’ relationships with English and Scandinavian language news outlets cautioning researchers to pay more attention to the role of the mass media. Their exclusive lens on small scale, sensational studies creates the need for comparison with Big Data studies that construct grand narratives to provide a more comprehensive picture of media influence on archaeological knowledge production and how that knowledge situates itself in much larger sociopolitical issues. How are the institutions that produce these publications influenced by this medialization process? Is their relationship with knowledge production and dissemination to public and political stakeholders changing accordingly?

Ultimately, the past is utilized for the personal and political agendas of anyone who has access to it, especially if researchers attempt to construct that past as “neutral” (Kristiansen, 1993, p. 3). This puts archaeologists between a rock and a hard place. We enjoy a place of privilege, and thus responsibility, in that we construct narratives of the past based on our data and interpretations that are to be accepted as fact by the various stakeholders who value our work. Yet our words alone are not solely responsible for the communication and reception of our research. What facets of engagement with archaeological knowledge are beyond our control? Do we fight against the rip current of mass media, or do we ride the wave?

1. 1 Aims, Objectives, and Research Questions

The entanglement of science, politics, and the media provides an invaluable lens through which to examine the production, communication, reception, and engagement of and with scientific knowledge. This thesis explores this deeply ingrained relationship with new material to shed light on how contemporary identity politics, mass media visibility, and technical paradigms in research are changing the way archaeological knowledge is produced and engaged with. Viking Age genomics studies that focus on mobility and origin will be utilized to investigate the following questions:

- How can an analysis of medialization in recent archaeogenetic research provide insights into and clarify the relationship between archaeology, politics, and the media? What changes have been or need to be implemented to ensure integrity of and combat misuse or misinterpretation of that relationship?
- In what ways has medialization influenced the communication of ethnic identity and origin in the Viking Age? How does this compare between Big Data and small data studies?

This thesis is framed as a meta-study of knowledge production and communication in which the Third Science Revolution in archaeology when compared with the public impact of Viking studies creates an ideal environment in which to investigate the above questions. Media attention and influence is not inherently a bad thing. Though, medialization is one of several factors that force institutions to use sensationalized claims, headlines, and rhetoric of certainty, generating possibly incendiary knowledge that caters to increasingly polarized groups of stakeholders. Yet these researchers and institutions are not absolved of responsibility in this process. Reflexivity and introspection are imperative and cannot be neglected where visibility and impact are prioritized. As the production and communication of science grows more medialized and politicized, researchers and institutions must make clear efforts to train in media literacy, vet press releases for misinformation and extend engagement efforts when communicating politically and publicly salient works.

Chapter 2. Tangled Histories: Current and Past Scholarship

This chapter contextualizes the three main pillars that make up the intellectual background of this thesis. It begins with a critical reflection of the role and legacy of the Viking warrior and Viking Age in constructing national identity in the contemporary Scandinavian nations during the last century. This will provide the foundation necessary to establish why genomic studies on Viking era populations are so provocative in public and political discourse. A brief overview of the Third Science Revolution in archaeology and how it has transformed the discipline will follow, problematizing the use of aDNA data in establishing archaeological identity. This chapter will conclude with a contemporary view of geneticized migration studies and their impact on popular and political discourse in various forms of media thus providing entry to theories of medialization to be used in the analysis to follow.

2.1 It is *our* history: constructing the “Viking Age” and national identity during the 20th century.

The image and symbolism of the Viking Warrior is infamous and prolific. Thor’s hammer, runic symbols, and horned helmets (rather ironically) can be found tattooed on the bodies of people storming the US Capitol building, printed on yoga mats and exercise equipment with phrases like “Nordic Strength,” or sold as gifts in major Scandinavian airports (see appendix I). How has this image emerged and tied itself with the national identity of the contemporary Scandinavian nations during the last century? And what does this tell us of the relationship between Viking archaeology and contemporary society and politics?

Romantic views of the Vikings had been imagined much earlier by thirteenth century saga writers in Iceland (Sommerville and McDonald, 2020). As such, the ingredients necessary for growing nationalism had also been cultivated in the decades prior to the turn of the century, many scholars attributing momentum derived from the French Revolution in the late 18th century to be a driving factor (Trigger, 2006). It is not until the nineteenth century when many national identities of Europe really begin to bud, coincidentally as scientific archaeology emerges from its infancy in Scandinavia (Croix, 2015; Trigger, 1984 and 2006). Trigger (1984,

p. 358) goes on to identify that this development of Scandinavian (and later European) prehistoric archaeology was encouraged by a “post-Napoleonic upsurge of nationalism and romanticism.” This sentiment continued throughout the nineteenth century as archaeology was professionalized in Europe.

The ways in which nationalistic sentiments are embodied or utilized are admittedly not monolithic. This thesis proposes three generalizations. The first may be perceived as a kind of romantic nationalism, more subtle in its performance. Holding a sense of pride in or patriotism for where one comes from isn't inherently a bad thing. However, this necessarily lacks an element of reflexivity considering that nationalism and shame cannot manifest mutually. Such shamelessness has the potential to expose itself in the form of prejudice. This vulgar kind of nationalism often evokes an ideological supremacy characterized by racism and xenophobia. A third kind of nationalism can be seen not as tied to individual performance, but in the presentation of national character. Regardless of how nationalism is performed, there is often specific intention in determining what is to be remembered of these histories and what is to be forgotten.

Croix (2015, p. 83) identifies how nineteenth century national romanticism in Scandinavia would construct the Viking era into a kind of golden age of history of unification, kings, and heroes according to the political needs of the time, and the abundance of textual accounts of the Northmen by foreign authors. The development of archaeology in the region at this time and the wealth of available material culture would help actualize this view, making it much more tangible. Towards the end of the nineteenth century, before the first World War, we can observe rising nationalist tendencies throughout much of Europe as political pressure and socioeconomic inequality required something to prompt unity and cooperation (Trigger, 1984). Many early Scandinavian archaeologists such as J.J.A. Worsaae and C. J. Thomsen (in Denmark) and Oscar Montelius and Hans Hildebrand (in Sweden), were interested mostly in cultural evolution through the detailed classification and comparison archaeological artefacts (Trigger, 2006). Trigger (2006, p. 248) remarks that early prehistoric archaeologists of Europe had the goal of extending “history as it was known from written sources back into the still more remote past.” Thus, it is too bold to claim that nationalistic intent was embedded in the very core of early

Scandinavian archaeology. Yet it is undeniable just how ubiquitous nationalism was at this time that we cannot say it had no significant influence. Even these early scholars framed the history they studied under a certain degree of ownership, a history of “our people.” This demonstrates that by the second decade of the 20th century, the nationalistic roots of the Viking age as a history of Swedes, Danes, and Norwegians were firmly placed in the soil of public and academic imagination (Svanberg, 2003).

Nationalistic sentiment supported by archaeology evolved somewhat slower in Norway considering that the nation did not receive political independence until 1905. The nation’s independence combined with the excavation of many ship burials from the Viking age, including the Oseberg ship excavated in 1904, fueled the use of a nationalist lens to examine their history. The nationalist use of ship burials and westward Norse expansion were continued in 1925 by Shetelig’s cultural-historic survey of Viking era archaeology in Norway. However, attitudes shifted approaching the first half of the twentieth century amidst the second World War, during which time the patriotic leanings of Shetelig and other Norwegian scholars were exploited by Nazis during their occupation of the country (Svanberg, 2003, p. 61).

This exploitation manifested in recruitment propaganda featuring Viking era symbolism that heavily leaned into the strength and pride associated with the image of the Viking warrior (fig. 1). Further, the leader of the Norwegian Nazi party organized the elite of his party in a manner reflective of the Viking and medieval ages and held meetings that would later include the SS at monuments and historic sites central to the Viking age. The writings of Hans FK Günther, a leading authority in scientific racism for the Third Reich, demonstrate how “Norse mythology and culture were used to structure the scientific racialist anthropology of the period” (Sommerville and McDonald, 2020, p. 485). This represents a very dangerous potential of nationalized histories. The legacy of this specific abuse of history by the Third Reich and their sympathizers in Scandinavia is still reflected in the polarizing ideologies of those who adorn Viking Age symbolism today (e.g. Castle and Parsons, 2019).



Fig. 1 (left): Nazi propaganda poster from occupied Norway reading: *Northmen Fight for Norway Enlist at Stortingsgata 12 Oslo*. Capitalizing on the patriotic leanings of Norwegian Viking scholars it suggests: “You’re no Viking if you don’t fight with us.”

The traumas of WWII saw a decline in nationalism across Europe and a considerable decrease in heroism and romanticism associated with Viking Age archaeology. Because of such trauma, Brink (2008, pp. 4-5) identifies a reframing of the Viking image halfway through the twentieth century to emphasize a more peaceful, industrious, and trading character. The core of this narrative was still one of unification and scholars towards the end of the 20th century continued this trend of framing the Viking

Age as a history of ancestry and ownership. The amalgamation of this scholarship through the last few decades of the 1900’s and into the turn of the century all contribute to what Svanberg has argued to be a “systematized” Viking Age in which the main features of this were not discovered but “were prefigured and then used to structure the textual and pictorial representations of the past” (Svanberg, 2003, p. 52).

These representations changed according to differing political needs pre and post WWII. They would change again during the peaceful and welfare conscious Scandinavia of the later 20th century that saw a revitalized “whimsical fascination with the Viking period, which was conceptualized as a violent, wanton, and romantic time in contrast to the dull and peaceful present” the idea of who *owned* this history went unquestioned (Trigger, 2006, p. 257). As Trigger (2006, p. 249) summarizes, “everywhere in Europe, the discipline of document-based history played an early and continuous role in cultivating ethnic identities and encouraging patriotic and later nationalist sentiments.” The tradition of knowledge production of the Viking Age in Scandinavia has been consistent with such a summary.

This tradition manifests in the present in very tangible ways. Each of the Scandinavian nations saw the formation of alt-right political parties at the end of the 20th century (Norwegian *Fremskrittspartiet* in 1973, Swedish *Sverigedemokraterna* in 1988, the Danish *Folkeparti* in 1995). All three parties are broadly anti-immigration (though predominantly Islamophobic), often EU-skeptic and undeniably nationalist in orientation especially as it relates to the cultural heritage of their nations (Niklasson and Hølleland, 2018) This increase in more “aggressive” nativism outlined by Niklasson and Hølleland has echoed throughout much of the Western world during the first decades of the 21st century resulting in the “growth in support of far-right political parties and the rise of groups that operate outside the political structure” (Castle and Parsons, 2019, p. 61). These sentiments have proven considerably volatile creating stark contrast with nativist ideology in Western populations. The introduction of aDNA analysis when utilized in migration and origin studies of past peoples, complicates an already nuanced and delicate discourse.

2.2 Revolution or Relapse? Problematizing Ancient DNA and the Construction of Identity

Ancient DNA analysis has been in development since approximately the 1980’s during which time it garnered serious attention and underwent additional technological innovations (Hagelberg, Hofreiter, and Keyser, 2015). The application of aDNA analysis remained limited in archaeology during the last two decades of the twentieth century. The late 90’s and early 2000’s saw genomic studies on Neanderthal and Neolithic human specimens by Pääbo and Haak respectively, but these publications remained in the infancy of aDNA analysis, and it would require a “technological paradigm shift” before such analysis reached greater maturity (Hagelberg, Hofreiter, and Keyser, 2015, p. 2).

The development of shotgun and next-generation sequencing during the 2010’s and earlier advancements in contamination protocols laid the groundwork for contemporary aDNA analysis. It is around this time that Kristian Kristiansen published his influential 2014 paper suggesting the beginnings of a Third Science Revolution in archaeology and possible benefits and consequences this revolution may have (see fig. 2). Kristiansen explores some of these consequences, but it is within the next decade that aDNA analysis in archaeology generates much of its criticisms.

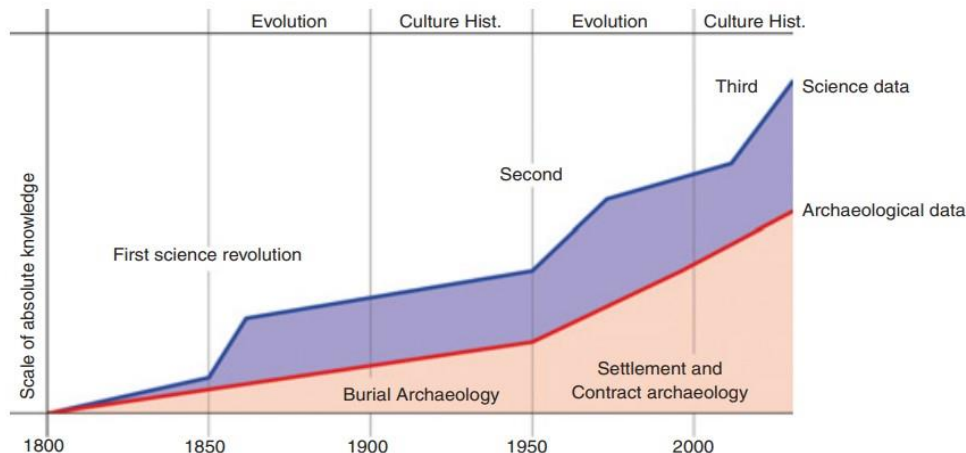


Fig. 2: Model from Kristiansen 2022 demonstrating the impact of three identified science revolutions on archaeological knowledge suggesting a transition from relative to absolute knowledge.

The main concerns with the current use of aDNA echoed by many researchers are the essentialist view of identity upheld by much genetic work, the challenges in cooperation between geneticists and archaeologists, as well as the potential to revert to outdated cultural-historic models of thinking (Crellin and Harris, 2020; Frieman and Hofmann, 2019; Furholt, 2019; Heyd, 2017; Ion, 2017 and 2019; Kristiansen, 2014).

The concern for essentializing identity on the basis of genetics is incredibly relevant for this thesis. Both anthropology and archaeology have put in decades of work to acknowledge the complexities of people's identity in the past and the present. Yet, as Crellin and Harris (2020, p. 43) both remind us, geneticists and archaeologists construct identity in fundamentally different ways. Historically, and in some cases contemporarily, archaeology has conflated facets of identity, such as sex and gender or ethnicity and culture. Such conflation essentialized these qualities as fixed and innate and therefore quantifiable (Díaz-Andreu and Lucy, 2005). This is not to say that aDNA does more harm than good in archaeological research. It has provided the opportunity to estimate the sex and gender of juveniles who cannot undergo reliable osteological analysis and forced researchers and laymen alike to reconsider gender and ethnic identity in the past (e.g. Hedenstierna-Jonson et al., 2017 and Moilanen, 2021). However, due to the discrepancies in genetic versus archaeological identity construction, greater care must be taken to

avoid the pitfalls of our discipline's past. Essentialist views may be a genetic reality, but they certainly do not need to be an *archaeogenetic* reality.

The imbalance created by interdisciplinary collaboration between geneticists and archaeologists is an incredibly relevant issue as DNA data continues to gain a spotlight in how archaeological identity is ascribed and engaged with. Some scholars are wary of the term “interdisciplinary” to begin with. Ion (2017, p. 192) for example, views archaeogenetic work as more akin to “collaborative multidisciplinary problem solving.” Ribeiro (2022, p. 95) recognizes that ancient genomic studies are more akin to “multidisciplinary” as well, even claiming that such collaboration is markedly simple and archaeology's role in that collaboration is quite mute. The cooperation between these two spheres is far less complex than it needs to be, often streamlining archaeological practice and interpretation (Ribeiro, p. 96; Ion, 2017; Furholt, 2019; etc.). We can consider migration studies as a clear example of the constraints in current modes of multidisciplinary collaboration.

This imbalance is further exemplified in ancient genomic studies where the seemingly simple definition of “migration,” differs extensively in genetic and anthropological/ archaeological contexts (Ribeiro, 2022; Ion, 2019). Such semantic and structural constraints include the ratio of authorship among geneticists to archaeologists and the criteria for publication in specific journals, many of which are accepted to big name science repositories such as *Nature* or *Cell Press*. These imbalances do not allow for aDNA analysis to be used to its full potential in answering archaeological questions.

Another concern discussed by many scholars is the way that contemporary aDNA work is often reminiscent of dated ideologies, namely that of Gustaf Kossina's (1911) culture-historical model, that dominated much of archaeological thought concerning mobility in the first half of the twentieth century (Furholt, 2019; Hakenbeck, 2019; Heyd, 2017; Kristiansen, 2014; etc.). Kossina's proposal was to equate archaeological cultures with ethnic identities and to link artifact distribution boundaries with ethnic and linguistic extent (Heyd, 2017, p. 350). While this school of thought was eventually overtaken by processualism in the second half of the twentieth century, a potential revival in this ideology was identified in migration publications, specifically

Allentoft et al. (2015) and a paper by Haak and colleagues that same year (Heyd, 2017; Furholt, 2020). The political impact of those studies has been explored previously and the threatening pitfall of a regression to the culture-historical model is a concerning reality of genomic studies that focus on mobility.

2.3 Mass Migration in the Mass Media: Contextualizing Origin, Ethnicity, and Immigration in Contemporary Identity Politics

The discipline of archaeology has long been intertwined with the politics of identity, migration, and the media that discusses it. Sensitive public and political discourses are now bolstered by genetic data where aDNA has become a new form of ammunition in the fight for control of the past. But what happens when genetic data produces results that conflict with that preconceived control of history? This question has grown ever more topical in the wake of increasing diversity as a result of (often refugee crisis driven) immigration. This is contrasted with rising neo-nationalism and growing support of alt- right governments in much of the western world (e.g. BBC, 2019; Wolf, 2022).

This complex and volatile environment is particularly salient in the Nordic and Scandinavian nations which, often viewed as remarkably progressive and utopic in much of the anglophone world, have seen a massive influx of immigration during the last two decades (Statista Research Department, 2022) (see fig. 3). This is impacted by political unrest in the middle east in nations such as Syria which, in the last ten years, has seen more than 14 million people forcibly displaced from their homes (UNHCR). Or more recently, Russia's war in Ukraine that has driven millions more to flee westward (United Nations Operational Data Portal). Sweden for example, has remained on the receiving end of such tragic refugee crises reflecting the highest rates of immigration out of any of the Nordic nations during this period, even after the much stricter policy implementation after 2016.

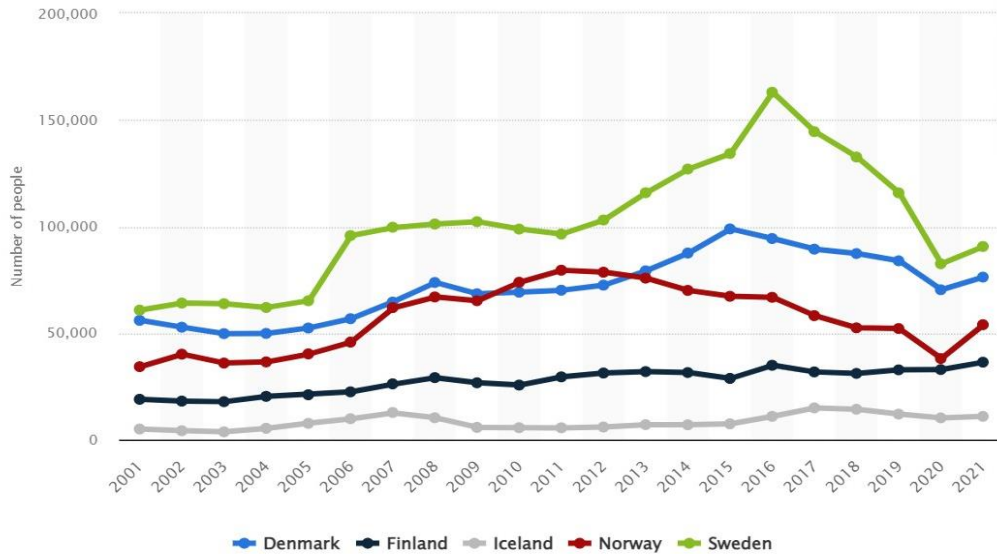


Fig. 3: graph from Statista showing immigration rates into the Nordic nationals over the last twenty years. Note that Sweden remains receptive of the largest number of people even after the spike of immigration in 2016 characterized by rapid decline in the years that follow.

Such high rates of immigration come directly into conflict with alt right views on migration and heritage ownership, which are predominantly xenophobic and nationalist (Niklasson and Hølleland, 2018). Yet even less-extremist parties must position themselves between nationalism and diversity. This is evident in Sweden’s current government’s plan to increase the median salary needed to acquire a work visa or the threat that asylum seekers may lose their permanent resident status in which their proposed solution for those “that lose their residency status should instead apply to become Swedish citizens” (Dagens Nyheter, 2023; my translation). Considering this political climate surrounding immigration, it is no surprise that research which comes into conflict with such a climate garner high visibility in the Nordics and beyond.

For example, three publications that have spurred much controversy in their conclusions and their relationship to the media are Allentoft et. al (2015) and Haak et al. (2015), and Kristiansen and colleagues’ own 2017 publication retheorizing the spread of proto-Indo-European. They offer important insight into the relationship between aDNA studies on migration and origin, dissemination via the media, and the political underpinnings of such research. These publications center around the identified Yamnaya culture who supposedly massively migrated from the Eurasian Steppe into western Europe and received considerable media attention. The violent,

androcentric narratives of this massive migration have been characterized by provocative university press releases such as the famous, inflammatory title from Copenhagen University (2017) proclaiming “Steppe migrant thugs pacified by Stone Age farming women” which was then massively spread in the media using similar titles (Frieman and Hofmann, 2019, p. 528; see also Hall, 2017 and Liberatore, 2017).

The narratives and ideologies suggested by these publications and perpetuated by the mass media have been demonstrated to resonate with alt-right sympathizers and white nationalists. Panofsky and Donovan (2019) identified that these stakeholder groups place a particular sense of value in the biological essentialism perceived to be provided by DNA data (see also Hakenbeck, 2019). In fact, Hakenbeck showed how prolific such archaeogenetic publications are, especially the three mentioned above, in alt-right spaces such as the online forum Stormfront. She revealed how the migration models proposed by these publications, suggesting a violent invasion from the east, “plays on fears about cultural extinction fomented by demagogic and right-wing reporting about contemporary migration” (Hakenbeck, 2019; Frieman and Hofmann 2019, 529). Such fears of cultural extinction at the hands of immigration from the east is directly reflected in the nativist, xenophobic rhetoric of Scandinavia’s far right political parties which are rising in popularity as exemplified by the Sweden Democrats who received a record 20.57 percent of the votership in Sweden's 2022 elections (Niklasson and Hølleland, 2019, p. 124; SVT, 2022).

Political debates surrounding immigration, diversity, and globalization are nothing new. Nor is the relevance of archaeology in such debates, especially when ethnic identity and origin come into question. Yet, it is undeniable how identity politics have been shaped at the turn of the century and complicated by the introduction of genetic data throughout the last two decades. Genomic research on past peoples continues to show pertinence, though not exclusively when focused on people during the Viking Age. The political climate in Scandinavia and the influx of refugee driven immigration into Europe clearly shows a need for care and nuance in the production of archaeogenetic knowledge and its dissemination.

2.4 Chapter One and Two Summary

These chapters have outlined the main objectives of this thesis and situated the subsequent analysis in a vastly complex history of scholarship, research, and politics. This has been achieved by way of three main contextual pillars fortifying the relevancy of the thesis. They include a history of Viking Age archaeology and the image of the Viking Warrior that has gradually been intertwined with Scandinavian nationalism during the last century and a half. Second, the Third Science Revolution in archaeology has featured new opportunities afforded by aDNA analysis and Big Data management. The methodology has gained intense criticism by academics specifically in its tendency to uphold biological essentialism of identity. Yet, many stakeholders value DNA data for the perceived objective truths it provides. Lastly, archaeogenetic studies on migration are growing more topical in the wake of increasing diversity and show a history of inflammatory dissemination practices by the mass media. The knowledge provided by these studies often aligns with or contrasts preexisting ideologies about immigration creating volatile discourse and attracting misuse. The research institution and media handling of Viking age genomic studies is immediately relevant today in a Scandinavia that grapples with the realities, real and imagined, of globalization and national identity.

Chapter 3. Theoretical Perspectives

This chapter is dedicated to the theoretical frameworks that inform this study, including media's role in science communication, the conceptualization of ethnic identity, and the notion of decolonizing the Viking Age.

3.1 The Perspective of Media

The theoretical frameworks drawn upon to conceptualize the media's role in science communication borrow from Science and Technology Studies (STS). The culturally dominant view of the popularization (communication) of scientific knowledge by the end of the 20th century had been an assumed two-stage model (Whitley, 1885, p. 13). This two-stage model suggests that researchers generate scientific knowledge that is seen as real or genuine, and popularizers disseminate simplified, less authentic versions of that knowledge (Hilgartner, 1990, p. 519). It assumes the sole authority on knowledge production to be that of the scientists where the media acts as translator and/ propagandist and “the public” is generally passive and strictly receptive. This model has been rebuked by many authors as reductive and inaccurate, maintaining hierarchies of expertise in which science has a monopoly on truth (Hilgartner, 1990, p. 533; Weingart, 1998; Rödder, 2009; Brittain and Clack, 2007; Franzen, Weingart, and Rödder, 2012).

This thesis aligns with these authors, adopting the perspective that “the stronger the dependence of science on public consent, the more important is attention and consent of the media” at which point the relationship is no longer linear, but reciprocal (Weingart, 1998, p. 871). This reciprocal relationship has been deemed *medialization* by Weingart (1998) and iterated upon by Rödder (2009) and Franzen, Weingart, and Rödder (2012). It is characterized by an increased media attention to scientific issues on the one hand, and an increased orientation of science towards mass media criteria on the other. As an analytical concept, medialization suggests that popularized knowledge “actively filters back into scholarly research, feeding the process of knowledge production” (Brittain and Clack, 2007, p. 32; see also Weingart, 1998, p. 872). Crucially, this is not to say that mass media is directly accountable nor morally at fault for this reciprocal relationship. The reciprocity of medialization refutes this. Brittain and Clack (2007,

34) capture this complexity quite well in their deconstruction of archaeology's relationship with the media:

“...academic knowledge is produced within a network of external and internal power relations, multiple competing dialogues of narrative, and the accountability of expert knowledge systems to historically situated sociopolitical contexts. The media seeps between the levels of the continuum, not as a facilitator of icons of truth between two opposite realms separate from the practice of knowledge construction, but as a part of the practice of archaeology itself.”

This thesis adopts a perspective inspired from the German tradition of differentiation theory which distinguishes social systems on the basis of communication, thus utilizing medialization as an analytical concept on the level of what, how, and to whom knowledge is being communicated (Luhmann, 1984; Rödder, 2009; Franzen, Weingart, and Rödder, 2012). There are three levels under which to study medialization from a communication-based perspective. The first (1) denotes individual responses to media attention. This specifically relates to the professional role of scientists in high profile fields and the position of “visible scientists” insofar as they garner scientific reputation contrasted with media prominence (Franzen, Weingart, and Rödder, 2012, 11; see also Weingart, 1998; Rödder, 2012). The second analytical level (2) seeks to understand organized responses from scientific institutions, publishing journals, etc. contrasting with the perceived roles of the individual researcher. The final level (3) asks whether mass media criteria are anticipated in the presentation of scientific knowledge by way of the scientific publication (and its associated supplemental material).

The criteria or qualities favored by the media that are embraced by this thesis include actuality, sensationalism, personalization, and locality (Weingart, 1998, p. 870). This thesis focuses solely on the institutional role in knowledge production and communication and thus only the second and third levels are considered. These theories provided by STS, namely differentiation theory of communication and medialization outline the perspectives of the mass media in the critical assessment of the three case-studies to follow.

3.2 The perspective of Identity

The conflation of certain dualisms surrounding identity such as culture and ethnicity or more recently, ethnicity and genes, reduces these concepts into fixed categories rendering them innate

and quantifiable from a positivist point of view (Alberti, 2005, p. 410; Díaz-Andreu and Lucy, 2005). While this perspective frames much contemporary archaeogenetic research, this thesis takes a different stance. It recognizes that the challenge in multidisciplinary cooperation lies in finding a balance between integrating genetic data that offers quantitative genetic profiles for individuals with a framework for conceptualizing identity (past and present) that is archaeologically and anthropologically inclusive.

Lucy (2005, p. 93) recognized this challenge and cautioned how the use of aDNA is still not able to “answer questions as to the (constructed and imagined) social or ethnic identities of those people.” This reframing of ethnic identity informs the theoretical perspective of identity construction and communication in this thesis. It takes a social constructivist stance that does not see ethnicity as a fixed, inherent facet of identity nor so flexible that it has little bearing on how one embodies their identity. It sees ethnicity as something negotiated at the level of social relationships (Lucy, 2005, p. 100). This relational view aligns itself with post-humanist scholarship which demands explicit political engagement, particularly when the study material is politically powerful (Crellin and Harris, 2020, 45; see also Braidotti 2013).

This is a perspective that has already been applied to sensational single burials on the basis of gender (Hedenstierna-Jonson et al., 2017; Price et al., 2019; Moilanen et al., 2022). However, Big Data studies that focus on ethnicity and origin explored by this thesis haven’t experienced the same reconceptualization. Thus, a theoretical perspective of ethnic identity aligned with a social constructivist view and positioned starkly against dualist or essentialist frameworks is indisputable, especially when we consider that the rejection of dualisms is “scientifically more accurate, politically necessary, and ethically essential” (Crellin and Harris, 2020, p. 44).

3.3 Theorizing the “Viking Age”

The perspective of the “systematized” Viking Age as argued in great length by Svanberg (2003, p. 97) is adopted by this thesis particularly in the scholar’s framing of the systematized construction as “a ‘colonization’ of the people, time, and geographic space” of the period. Because Svanberg describes the construction of the Viking Age as a colonization of the past, the turn to postcolonial studies provides perspective on how to deconstruct the time period. Postcolonial works attempt to dissect and dismantle European thought and power (knowledge)

structures (Svanberg, p. 27). It has rightfully received much criticism considering that such dismantling generally occurs within a Eurocentric intellectual discourse. Thus, this thesis considers a decolonial attitude towards these histories implying that there is still much work to be done rather than suggesting that the systems put in place by colonialism are a thing of the past (cf. Hamilakis, 2018).

A theoretical perspective on deconstructing the Viking Age seeks to de-emphasize the features that make it a nationalistic history. Svanberg (2003, pp .101-104) has identified five criteria including (1) the framing of the Viking Age as reflecting a homogenous Scandinavian culture, (2) the projection of modern geopolitical boundaries and identities onto this past, (3) the bias towards elite members of Viking society, (4) a primary focus on narratives of unification, voyages, and Christianization, and finally (5) the reliance on archaeology to simply illustrate textual sources. This thesis identifies Viking Age narratives that could be construed as nationalistic or decolonial in a Svanbergian sense according to the criteria he has identified above, applying this perspective in the analysis of the three case studies.

3.4 Chapter Three Summary

This chapter has outlined the theoretical perspectives employed by this thesis. The first section discussed the role of mass media in knowledge production and communication, identifying medialization as a driving factor in determining the relationship between science and its publics. It draws from a differentiation theory of communication focusing on the organized responses of scientific institutions and how they orient to criteria of the media. It has framed identity in a social constructivist and post humanist way refusing genetic dualisms and recognizing the need for political engagement in communication of past identity. Lastly, it takes a decolonial perspective to the study of the Viking Age rejecting more nationalistic leanings that highlight homogeneity of the past, golden age narratives, and projection of modern geopolitical boundaries

Chapter 4. Materials and Methodology

4.1 Introduction to the material

Research articles represent a foundation upon which scientific knowledge can be communicated and engaged with. They are the first (though not necessarily most influential) node with which stakeholders across publics can begin to form relationships with the knowledge that they value. Archaeogenetic publications specifically can dictate how ethnic and historical identity are to be consumed and perceived as truth by different publics, influencing how they navigate their own identities in the present. Because medialization informs this relationship, the research publication offers a crucial space to investigate and clarify the dynamic relationship between scientific knowledge, media, and society. By focusing on the scientific institutions that produce these publications and issue press releases, shortcomings in organized responses to knowledge production, communication, and engagement can be identified and improvements can be offered.

This section will briefly identify the three case studies and discuss how and why they were selected (research articles, supplementary information, and press releases) (Table 1).

A.

Publication	Publishing Journal	Access	Supplemental material	Press Release	Authorship	Metrics**	Funding
Rodríguez-Varela et al. (2023)	Cell (Cell Press)	Open	Yes: excel file*	Stockholm University	Humanities/ Archaeology/ Anthropology Dept(s): 18 (40.9%) Biological Sciences/ Genetics/ Medicine Dept(s): 16 (36.4%) Mixed Humanities and Stem Dept(s): 10 (22.7)	22 captures 70 mentions 253 social media (tweets) 1 citation(s)	Swedish Research Council (Riksbankens Jubileumsfond) Science Foundation Ireland European Regional Development Fund Future Neuro

Total: 44

*Model, subject and method details available at the end of the publication

** Metrics provided by PlumX Metrics

B.

Publication	Publishing Journal	Access	Supplemental material	Press Release	Authorship	Metrics**	Funding***
Margaryan et al. (2020)	Nature	Restricted	Yes*	Copenhagen University	Humanities/ Archaeology/ Anthropology	333 captures	Mærsk, Lundbeck, and Novo Nordisk Foundations
				Globe Institute Copenhagen	Dept(s): 34 (38%)	174 mentions	Danish National Research Foundation
				Aarhus University	Biological Sciences/ Genetics/ Medicine	909 social media (tweets)	University of Copenhagen
					Dept(s): 37 (41%)	67 Citations	Welcome Trust
					Mixed Humanities and Stem Dept(s): 3 (3%)		
					Other: 16 (18%)		
					Total: 90		

*Model, subject and method details available at the end of the publication

** Metrics provided by Altmetrics (note the interface and presentation of metrics differ)

*** Acknowledgements also reference multiple funding bodies supporting individual researchers and their contributions. For simplicity, only the donors referenced to support the whole work have been included in this table.

C.

Publication	Publishing Journal	Access	Supplemental material	Press Release	Authorship	Metrics**	Funding
Krzewińska et al. (2018)	Current Biology (Cell Press)	Open	Yes*	Stockholm University	Humanities/ Archaeology/ Anthropology	99 captures	Riksbankens Jubileumsfond
					Dept(s): 8 (53.3%)	18 mentions	Swedish Research Council
					Biological Sciences/ Genetics/ Medicine	112 social media (tweets)	
					Dept(s): 5 (33.3%)		
					Mixed Humanities and Stem Dept(s): 2 (13.3%)	32 Citations	

*Including method details and extended data report
** Metrics provided by PlumX

Table 1: Tables providing overview for each of the three case studies: (A) Rodríguez-Varela et al. 2023, (B) Margaryan et al. 2020, and (C) Krzewińska et al. 2018.

The case studies will be presented in chronological order. Older publications have had longer time to garner visibility, media attention, and elicit engagement from stakeholders. Thus, the relationship between the media, politics, and the publication itself as it relates to how long the research has been available will be clear. Additionally, archaeogenetic studies on Viking Age mobility are few. As such, the authors of each case study both borrow data from and draw comparisons between research from previous years. In this way, when the case studies are presented in chronological order, their insights build off of one another as this specific field of study grows more mature and informed.

The oldest of the three publications is Krzewińska et al. (2018) published in *Current Biology* (a Cell Press journal) under the title *Genomic and Strontium Isotope Variation Reveal Immigrant Patterns in a Viking Age Town*. It is the most multidisciplinary of the three case studies, utilizes the smallest data set, and features the lowest authorship. The second case study, published in *Nature* just two years after the first, is Margaryan et al. (2020) titled *Population Genomics of the Viking World*. This Big Data study was one of the largest ancient genome sequencing projects of the Viking Age for its time and boasts the largest dataset and highest authorship. The last case study, Rodríguez-Varela et al., is also characterized by Big Data and was published in *Cell* at the very beginning of 2023 under the title *The Genetic History of Scandinavia from the Roman Iron Age to the Present*.

These case studies were chosen due to a variety of selection criteria. For the publication to be considered as “archaeogenetic” the primary data source needed to be aDNA. Consequently, the publications skew to more contemporary sources considering that the sheer quantity of human aDNA research increased dramatically during the second decade of the 21st century (fig. 4) The case studies were also chosen on account of their focus on answering questions regarding

mobility, migration, and genetic origin. This also biased the case studies towards more recent publications because prior to roughly the mid to late 2010's, mobility and urbanity were broadly unexplored in a Viking Age context (Krzewińska et al., 2018, p. 2730).

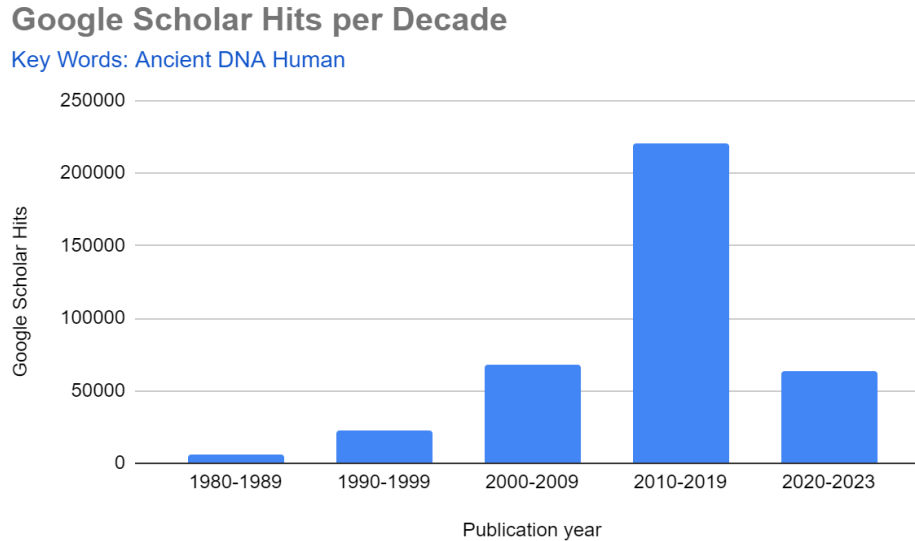


Fig. 4: Chart depicting an approximate google scholar hits for publications focusing on human ancient DNA. Note that the most recent time block only consists of three years accounting for its relatively small size. It has almost surpassed the first three decades in just one tenth of the time.

Another factor considered when selecting which case studies to examine was their relative visibility. The impact of mass media is much easier to assess when the study in question has produced some sort of reputation in the media. The general visibility for many academic publications is reflected in attention metrics often established by third party platforms. The metrics established by these platforms included the number of views or downloads, number of citations, news outlet coverage, and social media mentions. They provided a base line to consider which publications have received the most attention.

The inclusion of supplemental material was important for selection as an addition to the publication that often goes under looked (Heyd, 2017, p. 357). Lastly, the publications selected needed to be associated with at least one official press release (appendix IV). The importance of the press release in the dissemination of academic material cannot go understated and has been used as a crucial vessel for analyzing the relationship between scientific knowledge production

and the media (Frieman and Hoffman, 2019; Hilgartner, 2012; Källén et al., 2019; Rödder, 2009 and 2012; Sultson and Ferry, 2002). After all, “knowing where, how, and when to publish a press release can be the difference between a successful report and one that goes unnoticed” (Brittain and Clack 2007, 35). This factor has also contributed to the bias in more recent publications because contemporary press releases are much more accessible in university press archives. For each of the case studies selected, official press documents were released on the same day that the research article itself was published.

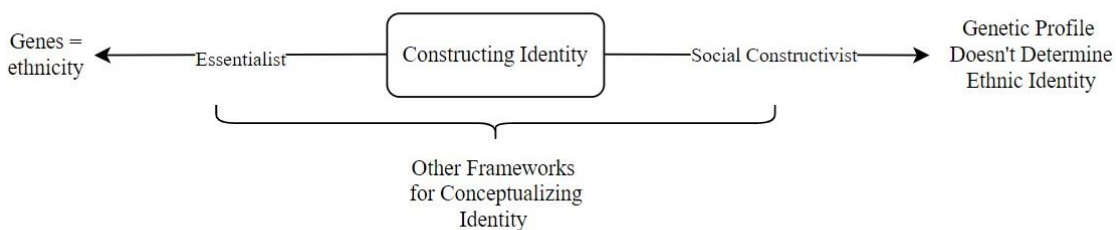
4.2 Methodology

All the source material will be investigated consistently along three analytical nodes of Viking Age conceptualization, construction of ethnic identity, and orientation to media criteria. Each will be used as a kind of lens with which to dissect the texts. Critical and close reading will begin with the supplementary material, follow with the research article itself, and conclude with the press release(s) to deconstruct the relationship of knowledge dissemination among all three sources. Each of the case studies will be analyzed in their own chapters before a critical comparison of the three is conducted.

4.2.1 Investigating Identity

The way ethnic identity is presented in these sources must be investigated to determine what framing is most prevalent in the organized media responses of archaeogenetic publications and how those change or are informed by the dissemination process. For the sake of simplicity and consistency, identity was coded on a kind of binary of “essentialist or not” though it is important to note that it manifests on more of a spectrum (see fig. 5).

A.



B.

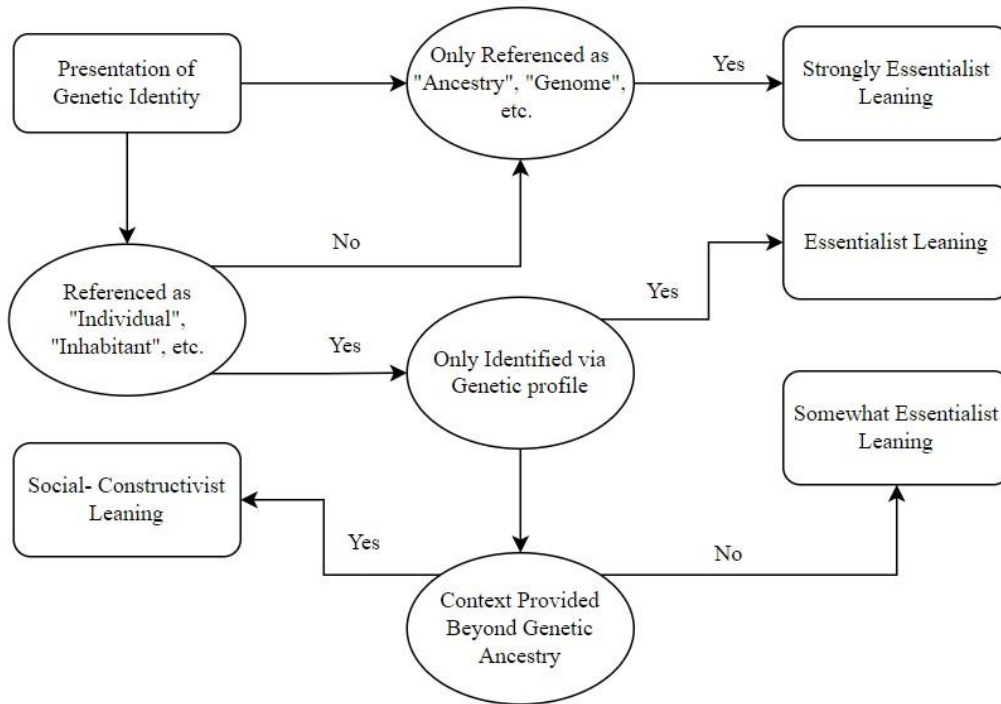


Fig. 5: (A) Graphic depicting the different poles of presenting ethnic identity. (B) Flow chart representing a simplified flow chart for determining how a phrase is constructing ethnic identity.

How intimately are the texts trying to get to know and construct the ancient people being studied? Do they attempt to attribute a sense of personhood to the described migrations or are they simply presented as the metrics of gene flow?

4.2.2 Investigating Viking Age Conceptualization

Deconstructing how the Viking Age as a phenomenon is communicated in the source material is necessary to assess the changes taking place and what may be influencing them. This was also coded on a kind of binary in which phrases were attributed to convey a possible nationalist or anti-nationalist sentiment using the criteria outlined by Svanberg (2003) (fig. 6).

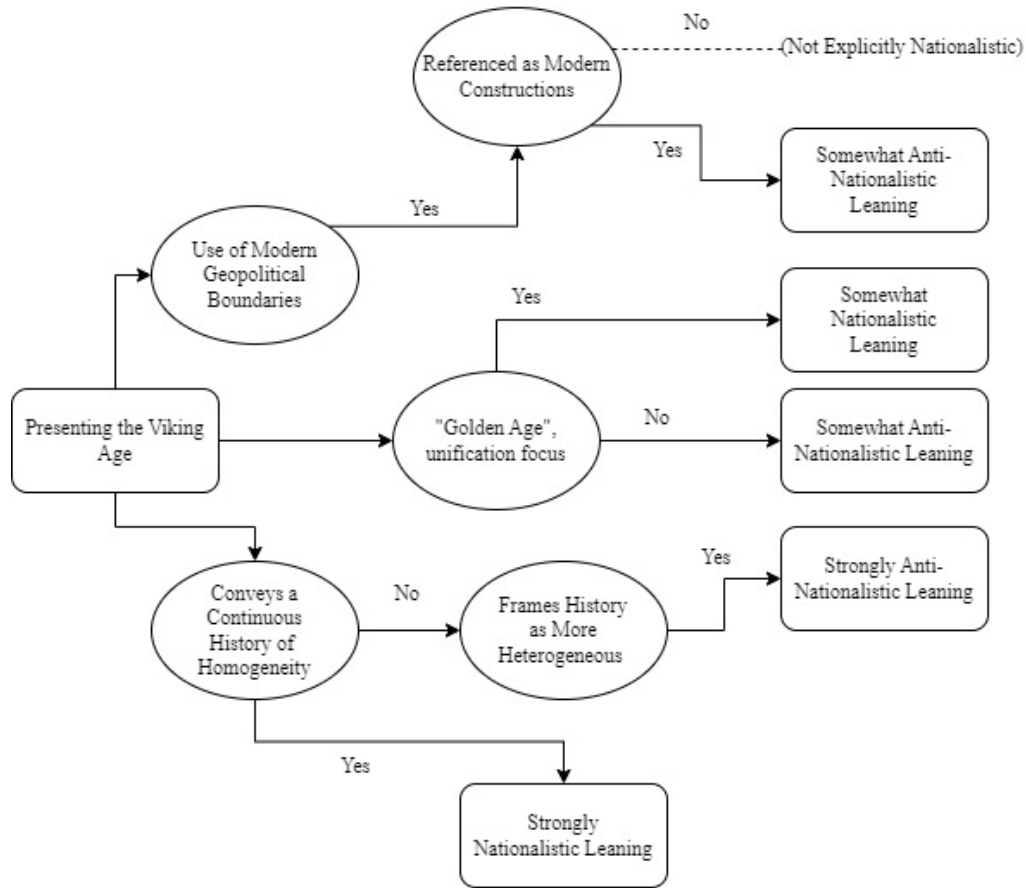


Fig. 6: Flow Chart depicting a simplified thought process for determining how nationalist-leaning phrases discussing the Viking Age may be. The dashed line represents a framing used in the case studies that could technically be considered nationalist according to Svanberg but is not considered so by this thesis.

It is important to note that the communication of these factors in the texts does not necessarily imply the construction of nationalistic narratives implicitly or explicitly. It is rather where these factors intersect in relation to what kinds of conclusions are emphasized that contribute to a sense of nationalism or anti-nationalism. The conceptualization of the Viking Age was investigated through these lenses in the source materials for each individual case study and then compared at the end of each chapter.

4.2.3 Investigating Media Criteria

Orientation to media criteria was coded according to the criteria actuality, locality, personalization, and sensation as discussed by Weingart (1998). Actuality is rooted in the presentation of fact and has been framed in this analysis as the use of rhetoric of certainty,

referenced from Källén et al. (2019), and rhetoric of uncertainty/ skepticism (fig. 7) (see table 2 for the other criteria). The presence of this criteria in the language of the texts was dissected and quantified to establish to what degree findings are communicated with certainty versus skepticism.

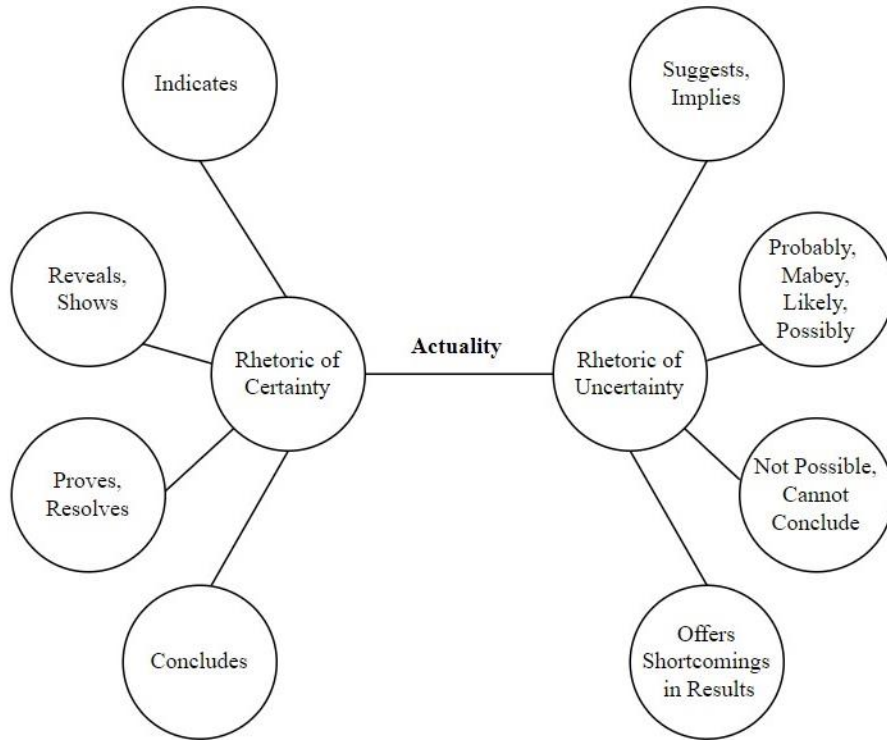


Fig. 7: Example words and phrases using what has been deemed as rhetoric of certainty or uncertainty.

The language with which scientific results must be communicated in research articles leads to a sense of certainty favored by the media. Thus, the aim was not to establish a sense of value in communicating confidently versus skeptically but rather to assess how often certainty or skepticism in results are translated through supplementary material, the publication, and finally the press release.

Other Media Criteria		
Locality	Personalization	Sensation
Place Names	Reference to Modern Populations	Emphasizes Novelty and Grandeur
Reference to Geography	Locality (subjective)	Shock Value
Use of Maps		Polarization

Table 2: Table depicting example themes or tools used in texts that align with the three media criteria of locality, personalization, and sensation.

Locality was surveyed via place names, archaeological site identifiers, geopolitical borders etc. While this has been described as an important criterion for the media, it is also a necessary criterion with which archaeological and population genomic research must be communicated. Personalization has been framed under attempts in the texts to provide relevance to contemporary readers. Like locality, this is a necessary criterion used in archaeological publications which must establish why their results are personal or relevant to stakeholder groups. Sensation was surveyed in the text via bold claims and emphasis on the grandeur of the research being conducted. Rather than the other criteria that could be conveyed quite neutrally, sensation is a tool of value and thus this communication of novelty or value was searched for in the texts. The presence of these criteria alone does not indicate influence from, or orientation to, the mass media. It is the intersection of these media criteria (for example sensation with actuality or locality with personalization) that are much more indicative of the medialization process.

Chapter 5. Case Study 1: Krzewińska et al. (2018) Genomic and Strontium Isotope Variation Reveal Immigrant Patterns in a Viking Age Town

This chapter provides an overview of the findings from Krzewińska et al. (2018) before analyzing the publication alongside its supplementary material and Stockholm University press release. This case exemplifies how the medialized relationship of knowledge production and dissemination goes too far so as to make unsubstantiated claims falsely supported by actuality and sensation to anticipate visibility and impact. It is enacted not just at the level of the media office but at that of the research institution as well. The findings of the article are valid and convey ethnic and Viking identity in a nuanced way revealing unprecedented complexities for this time and its people. Yet the ethical communication of these findings suffers at the expense of what appears to be a prioritization of media orientation throughout all three source materials.

5.1 Publication Summary

Krzewińska and her colleagues explore the impact of mobility on northern European urban populations, utilizing genomic data from 23 individuals from the 10th to 12th century-Swedish town, Sigtuna (fig. 8). The contexts represented are early Christian burials, considering that the majority mortuary tradition in pre-Christian Scandinavia was likely cremation, thus rarely providing usable aDNA. The core themes investigated in this study are genetic diversity, origin of the town's inhabitants, and the role of mobility in urbanization. The town of Sigtuna is located in eastern central Sweden outside of Stockholm. It was central in the Viking age, especially in the establishment of Christianity in northern Europe (Ros, 2012) The archaeological material available already suggested a distinct international character to the settlement.

Multiple methods were combined in this study namely genetic, isotopic, archaeological, and osteological analysis. Genome-wide data was generated for 23 individuals, 16 of which were subjected to strontium isotope analysis. Isotopic analysis was also conducted on 15 additional individuals. Strontium isotope ratios showed where a person lived (approximately), and the aDNA data revealed to whom or to which groups a person was broadly related. All of the

individuals were excavated from three burial types: four different cemeteries (not associated with churches), one churchyard (associated with one church), and one mass grave.

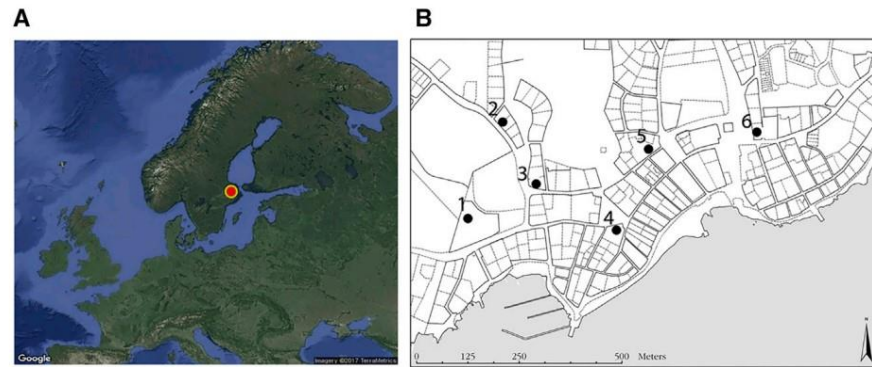


Figure 8: Map from Krzewińska et al. (2018, p. 2731) depicting the location of Sigtuna (A) and its town plan (B). Numbers 1 through three (1, 2, 3) are the first three cemeteries, (4) is church yard number 1, (5) represents the mass grave, and finally (6) is the fourth cemetery.

The results of their study indicated broad genetic distribution among the 23 individuals, most of which fell within modern day variation of Northern Europeans while some samples showed greater affinity for eastern, western, and central European populations. Additionally, 16 of the 23 individuals assessed for strontium isotope values revealed that half were of nonlocal origin. Four of these individuals were genetic outliers, while the other 4 showed genetic affinity with modern Norwegians. Krzewińska and her colleagues propose that they may be considered first-generation, short-distance immigrants. Two individuals with local strontium signatures fell close to Norwegian and Ukrainian gene pools, which the researchers speculate could indicate a second generation of immigrants. Ultimately, the combination of aDNA and strontium isotope data led Krzewińska and her fellow researchers to identify three groups of residents depending on genetic variation and strontium values: locals, short-distance immigrants, and long-distance immigrants (Krzewińska et al., 2018, p. 2733) Within the town, the authors identified a greater degree of genetic diversity in the late Viking Age than that of late Neolithic and Bronze Age cultures and modern East Asians.

The results of this study indicated a high level of diversity and mobility revealing a “cosmopolitan” nature to this late Viking Age town. Additionally, of the 31 individuals sampled for strontium isotope analysis, 28 that had assigned biological sex revealed that “70% of the

females and 44% of the males from Sigtuna were non-locals”, though the statistical significance of migrating ratios was not great and thus it was deemed that there was no concrete evidence of a sex-specific mobility pattern (Krzewińska et al., 2018, p. 2734). The observed patterns of genetic variation and strontium isotope values make the most sense if we accept a narrative in which both males and females were mobile regionally but also migrated longer distances in which Sigtuna functioned as an important node in a network of similar urban hubs throughout Northern Europe. Importantly, the research suggests that such a network was not composed of a homogeneous, specifically Scandinavian “Viking” population distinct from the rest of Europe (Krzewińska et al., 2018).

5.2 Analysis and Results

This case study was published in *Current Biology*, a Cell Press journal where accepted publications must “explicitly aim to inform non-specialists.” It must intend to “tackle important issues” ensuring that the research paper is “read, used, and talked about by the right people” (Current Biology; Cell Press). Even before reading it is clear that a specific sense of visibility, impact, and engagement is to be anticipated when publishing in this journal.

5.2.1 Supplemental and Extra Material

The supplemental material for this publication must be accessed externally from the article. It is provided in both pdf and xlsx forms containing extra figures and data tables. Ten detailed pages of extra material outlining the model, subject, method, and analysis details are provided and available attached to the article when it is accessed online.

The data provided in the supplemental material is in the form of large spreadsheets and convoluted visual representations. They’re not designed to provide or communicated nuance of identity nor is it their purpose. This is further evident by the presentation of sampled material and the reduction of the individuals referenced to a serial number and a bone fragment (appendix II.III) The essentialization here holds little bearing on the subsequent article and press release to follow. More interesting, is the bias in sampling revealed in the supplemental table S1 regarding

where the samples were taken from, and the sex and age of the individuals studied (appendix II.V). It provides a list of analyzed burials and individuals divided by the six burial contexts in which they were excavated. The issues with extrapolating such a small data set to represent larger society are complicated further by the unbalanced sampling among the sites (fig. 9). This data can also be referenced in Table 1 of the publication itself (see appendix II.IV).

The presentation of identity is different in the extra material, which is provided as text information rather than spreadsheets or data tables like the supplemental information. Here there is a much greater sense of personhood imbued in the samples. They are referred to repeatedly as “individuals” or “inhabitants” and extended effort is made to provide archaeological context to the town of Sigtuna and all six burial sites from which the people were excavated. Additionally, there are efforts described on the final page of the article’s extra material to reconstruct the physical appearance of seven individuals from Sigtuna regarding hair, eye, and skin color. Six individuals yielded data allowing the prediction of eye color all of which indicated a blue-color phenotype. All seven individuals were predicted to have some variation of blond hair and light skin tone.

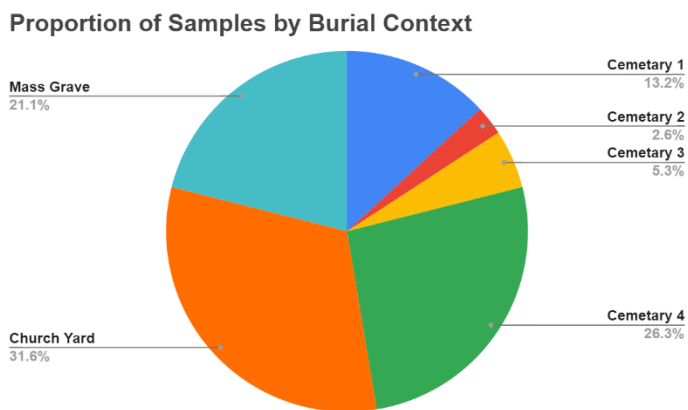


Figure 9 (left): visual representation of the sampling ratios generated for Krzewińska et al. (2018). Note the imbalance.

This information does not make it into the main body of the article. It is important to consider that these results align with certain preconceptions of Viking identity while the main conclusion of the article, on the other hand, represents an attempt to reconsider such preconceptions. The predicted phenotype would lend to a more stereotypical or homogenous construction of national identity though this doesn’t align with the objective of the researchers, thus we must assume that this detail may have been left out intentionally. There is no other substantial data from either the supplemental material nor the extra information that provides any insight into the characterization of the Viking Age as a kind of nationalist or anti-

nationalist history. There is discussion of Sigtuna’s location within modern geopolitical borders in the extra material but any notion of ownership of the region or its history is not evident. Orientation to specific media criteria is similarly challenging to discern in the supplemental material (Table 3)

Media Criteria	Supplemental/ Extra Material
Actuality	Metrics and complex figures
Locality	Present throughout (place names)
Personalization	NA
Sensation	Data Extrapolation*

*Only Present in extra material after article text.

Table 3: Media criteria in the supplemental and extra material provided by Krzewińska et al. (2018)

The unbalanced extrapolation of a small amount of data made to represent a larger whole is framed in a particularly sensationalized way in this article. The authors claim that “up to 55% (17 of 31) of the population in Sigtuna may have been of non-local origin” (Krzewińska et al., 2018, p. e6, see also p. 2734). The 55 % in question is of course not representative of the entire population of Sigtuna but rather the 31 individuals from which isotopic data were analyzed. Some phrases communicating a sense of uncertainty are employed such as “up to” or “may have been” but the takeaway is clear: roughly half of the inhabitants are non-local. This issue is consistent with the extrapolation of sex-based differences in origin as well. Of the 28 individuals with assigned sex, 7 out of 10 or 70 % of females had strontium isotope ratios indicating non-local origin while 8 out of 18 or 44% of the males suggested just that. There is a critical issue here regarding the size of the data and the size of the claims being made even just in the supplemental material. It is indicative of rather unethical scholarship that suggests that the anticipated visibility and impact of the research results may have taken priority over communicating results transparently and with integrity.

5.2.2 The Research Article

Identity in this publication is communicated with a considerable sense of complexity and nuance. The small size of the data allows for some nuance to be attributed to the “inhabitants,” “kin-

based groups,” “individuals,” and “people” of Sigtuna. There is clearly a greater attempt at understanding this small sample size as not just data but groups of people who lived, moved, and died. The breakdown of the sampled individuals into locals, regional immigrants, long-distance immigrants, and possible second-generation immigrants as well as the exploration of certain “curious cases” supports this (Krzewińska et al., 2018, p. 2732). The article exemplifies this further in the narrative construction of some inhabitants suggesting where some female potters may have grown up in relation to their resting place in Sigtuna. Clearly, this paper attempts to present narratives of individuals beyond simply their genetics. This can be attributed to the combined use of DNA and isotopic values painting a fuller picture of “the Sigtuna individuals.”

Just as complexity is afforded to identity in this article, it is also afforded to the Viking Age, evident in explicit efforts to deconstruct the Viking narrative as one owned by a homogenous group throughout history. The geography of the study is framed under the modern geopolitical borders of Scandinavia and Sweden especially under such phrases as “expansion from Scandinavia” or “processes in Scandinavia” (Krzewińska et al., 2018, p. 2730). Though this cannot be construed as nationalistic considering the efforts in reframing the nationalistic image of the Viking warrior or Viking town and presenting the narrative of Sigtuna as a place of substantial heterogeneity. This is evident in phrases such as:

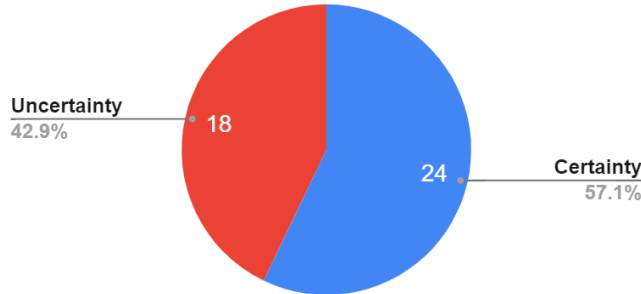
- “The inhabitants of Sigtuna were **heterogeneous** in their genetic affinities...” (2730)
- “Thus, the PCA indicated **substantial heterogeneity among all individuals** from Sigtuna and even within sites” (2731)
- “We **do not find a specific Scandinavian “Viking” population** distinct from the rest of Europe; rather, the population was integrated in the northern European gene pool at the time” (2734)
- “... their inhabitants **did not consist of distinct homogeneous sub-populations...**” (2734)

Crucially, these claims of heterogeneity must be viewed critically considering that they rely upon the imbalanced extrapolation of a considerably small data set that is assumed to be representative of a larger population. This extrapolation must also be viewed critically when analyzing the presence of media criteria. The criteria of the media most present in the publication itself are actuality and sensation. The other criteria (locality and personalization) are present but only in the capacity that is needed to communicate archaeological knowledge. To assess actuality, some

42 phrases communicating results of the data were surveyed for their degree of certainty or uncertainty (fig. 10).

Actuality Ratio of Surveyed Phrases

Krzewińska et al. (2018)



Phrases Communicating Certainty	Phrases Communicating Uncertainty
<ul style="list-style-type: none"> • “The data revealed...” (2370) • “Our results uncover...” (2370) • “...confirming that early urbanization...” (2370) • “Eight of the 16 individuals were confirmed as...” (2732) • “Hence, no evidence of...” (2734) 	<ul style="list-style-type: none"> • “Some of them may have been used...” (2731) • “These curious cases may be considered...” (2732) • Though speculative it is possible that...” (2732) • “Some female potters are thought to have” (2734) • “Therefore, is appears as if...” (2734)

Figure 10: (top) Chart depicting ratio of uncertainty and certainty rhetoric of 42 surveyed phrases. (bottom) Table with examples of surveyed phrases (see appendix III.VI for full table).

Issues arise when such rhetoric of certainty is used in tandem with the extrapolation of results from small data sets and communicating these findings in a sensationalized way. For example, the phrase such as “Thus, the PCA indicated substantial heterogeneity among all individuals from Sigtuna and even within sites” (Krzewińska et al., 2018, p. 2731) is quite certain in its framing, though fails to communicate that it is in fact referring to just the relatively small sample that was analyzed. This lack of clarity paints a different picture where the reader should in fact be questioning whether the results are truly indicative of the town as a whole. This occurs again when looking into sex-related mobility where the publication claims that the results “show that 70% of the females and 44% of the males from Sigtuna were non-locals” (Krzewińska et al., 2018, p. 2734). The sensationalized presentation of these results as a kind of truth muddles how it is perceived and thus how it is disseminated via the press release. Additionally, the last line of

the publication is sensational in its communication but attempts to qualify the results of the paper: “If late Viking Age Sigtuna is representative for those towns, their inhabitants did not consist of distinct homogeneous sub-populations but should rather be viewed as a cosmopolitan group” (Krzewińska et al., 2018, p. 2734). This is quite substantial considering that the extrapolation of their results to larger society not only hinges upon the small data set of individuals as representative of masses of people but also that Sigtuna itself is representative of other towns contemporaneous to it. This exemplifies how an intentional lack of clarity, especially regarding the shortcomings of research, lends itself to media influence and public impact at the expense of integrity.

5.2.3 Stockholm University Press Release: *Half the population of the Viking-town Sigtuna were migrants*

It is clear from the start of the press release that there is an explicit attempt to communicate identity in a nonessentialist way (see appendix IV.IV for the full text). This is evident in the very first line of the text “New analysis of the remains of 38 people who lived and died in the town of Sigtuna during the 10th, 11th and 12th century...” (Stockholm University, 2018, p. 1). The press is communicating that the individuals sampled are not simply repositories for data but people who had stories of their own. This distinctly human side to the results is continued throughout the press release and emphasized with the photo of a skeleton from Sigtuna. The stereotypical dangers of genetic essentialism when using aDNA data are nonexistent in the press release.

Consistent with the supplemental/ extra material and the publication, modern geopolitical boundaries are used in the press release to contextualize the results and the narrative of the Viking warrior. Maja Krzewińska accounts for the geography of Viking expansion: “We’re used to thinking of the Vikings as a traveling kind and can easily picture the schoolbooks with maps and arrows pointing out from Scandinavia, as far as Turkey and America, but not so much in the other direction.” (Stockholm University, 2018, p. 1). It is thus understandable that this simple accounting of the geography must be done using boundaries or place names familiar to the reader and do not indicate intentional nationalism for these regions.

The media criteria intersect in various ways through this press release. The often-misleading combination of actuality and sensation is present throughout. All but one of the phrases communicating results are framed using a rhetoric of certainty. There is considerable irony in its use. For example, the press release states: “The results are clear: around half the population of Viking age Sigtuna originated from outside Mälardalen” when in fact these results are anything but clear. This combination of actuality and sensation, present in both the extra material and the main body of the article, now constructs the foundation upon which the whole press release rests. The title alone is evidence: “Half the population of the Viking-town Sigtuna were migrants.” The text claims that the other half of these inhabitants were “equally divided into regional immigrants... and long-distance immigrants from further away...” (Stockholm University, 2018, p. 2). A final example of how problematic extrapolation of the results in the publication and extra material manifests as fact in the press release is regarding sex-based mobility with the claim “approximately 70 percent of the female population was immigrants, compared to 44 per cent of the men” (Stockholm University, 2018, p. 2).

Other media criteria are present in the press release as well such as an established sense of locality and personalization referring to the present-day Sigtuna as a “picturesque town... home to around 10,000 people” (Stockholm University, 2018, p. 1) It is strikingly clear that the media criteria present in the press release were built upon the existing presence of such criteria in the supplemental and extra information as well as the publication itself (table 6).

Actuality and Sensation in the Extrapolation of Results

Extra Material	Research Article	Press Release
<p>“...the strontium isotope ratios indicate that up to 55% (17 of 31) of the population in Sigtuna may have been of non-local origin. The sample size is small, but there is a marked difference between the adult females and males in the proportion of non-locals versus locals; 70% (7 of 10) exhibit non-local isotopic ratios among the females and 44% (8 of 18) among the males” (e6)</p>	<p>“...the PCA indicated substantial heterogeneity among all individuals from Sigtuna and even within sites” (2731)</p> <p>“The strontium isotope ratios in 28 adult individuals with assigned biological sex and strontium values ... show that 70% of the females and 44% of the males from Sigtuna were non-locals” (2734)</p>	<p>“The results are clear: around half the population of Viking age Sigtuna originated from outside Mälardalen” (2)</p> <p>“The immigration to Sigtuna was common for both males and females. Approximately 70 percent of the female population was immigrants, compared to 44 percent of the men” (2)</p>

Table 4: Table depicting how the extrapolation of strontium isotope analysis results are communicated across the three source materials.

5.3 Chapter 5 Summary: Conclusions from the Sigtuna Case-study

The chapter has presented a broad overview of the publication *Genomic and Strontium Isotope Variation Reveal Immigrant Patterns in a Viking Age Town* by Krzewińska et al. (2018). It analyzed its medialized production of knowledge and communication of Viking and ethnic identity from an organized, institutional perspective via the publication, the supplemental and extra material provided, and its official press release.

The identities constructed and communicated in this case study are provided considerable nuance and complexity throughout all three data sources. It is clear from the start what picture is to be painted: A Viking town populated by diverse inhabitants. This picture remains consistent throughout. This article positions itself firmly in a paradigm shift in Viking scholarship in which nationalistic preconceptions of this period are being reconsidered and the definition of what it meant to be a Viking is being expanded. It is also reflected in the political needs of the time as Källén et al. (2019) recognize that this article was published just weeks before the national elections that were and have been characterized by migration juxtaposed against national identity.

The intersection of sensational claims with rhetoric of certainty (actuality) generates a pitfall that is not unique to the press release. Rather it is intimately woven into the fabric of all three data sources. Critically reading between the lines allows for the shortcomings of the research to be identified. Yet, this becomes nearly impossible the farther down the knowledge dissemination pipeline one travels considering that the limited sense of uncertainty communicated in the article and its supplementary material is nonexistent in the press release. This case study is indicative of how medialization combined with a lack of transparency in communicating the shortcomings of results feeds into a relationship that is deeply steered by media and contemporary political discourse. Orientation to the media appears to be operationalized to impact visibility at the expense of communicating findings with integrity. The conclusions produced in this research

article are valid, yet the extrapolation of these conclusions enforced with an unsubstantiated sense of actuality and sensation suggest that visibility was anticipated and thus capitalized on. Ethical communication of conclusions is imperative in all the source material where knowledge is produced and disseminated so that visibility and impact is not prioritized at the expense of integrity.

Chapter 6. Case Study 2: Margaryan et al. (2020) *Population Genomics of the Viking World*

This chapter provides an overview of the findings from Margaryan et al. (2020) before analyzing the publication alongside its supplementary material and Copenhagen University's Globe Institute and press office press releases. The presentation of ethnic and Viking identity are largely consistent across the data sources as essentialist and anti-nationalistic in a Svanbergian sense respectively. Nuance and complexity are only attributed to those individuals with sensational genetic profiles. Concluding claims are made with considerable sensation and actuality yet misinformation is communicated in the Globe Institute's press release. This indicates that while visibility was likely anticipated, efforts were not made to ensure accuracy in the dissemination of results. This case represents a relationship between researchers, their institutions, and the mass media that has not changed to use medialization in a constructive way. The oversimplification or misrepresentation of results is not the sole responsibility of the media but must be engaged and mediated by researchers and the institutions they work under.

6.1 Publication Summary

Margaryan and colleagues focused exclusively on the centuries associated with the Viking period, between approximately 750-1050 CE and investigated gene flow from immigration into Scandinavia during this time to assess the global influence of Old Norse expansion. These scholars shotgun sequenced aDNA sampled from 442 individuals in sites across Europe and Greenland dating well prior to and exceeding the time frame of what has been argued as the Viking period (fig. 11). Additionally, these samples were analyzed together with 3,855 published modern individuals, and 1,118 published ancient individuals. Importantly, they structure their genetic data along topographical boundaries rather than modern geopolitical borders.

The findings of Margaryan et al. (2020) provide insight into a myriad of different themes related to the genetic origins of Viking age peoples in what is now Scandinavia, the genetic impact of diaspora movements, gene flow into Scandinavia at this time, and the genetic legacy of the Viking Age in modern populations. The researchers found certain “inexact and indicative”

affinities with modern populations that they have deemed ‘Danish-like’, ‘Swedish-like’, ‘Norwegian-like’, and North Atlantic-like’ where the gene flow within Scandinavia followed a south to north orientation (Margaryan et al., 2020, pp. 391-392). They note that the genetic structure within Viking age Scandinavia is characterized by greater diversity in more “cosmopolitan centers” and “trade-oriented islands.” The main diaspora related insights discussed in this case-study refutes the assumption that only individuals with Scandinavian genetic ancestry could hold the “Viking” occupation, citing Pictish people as potentially having integrated into Viking culture.

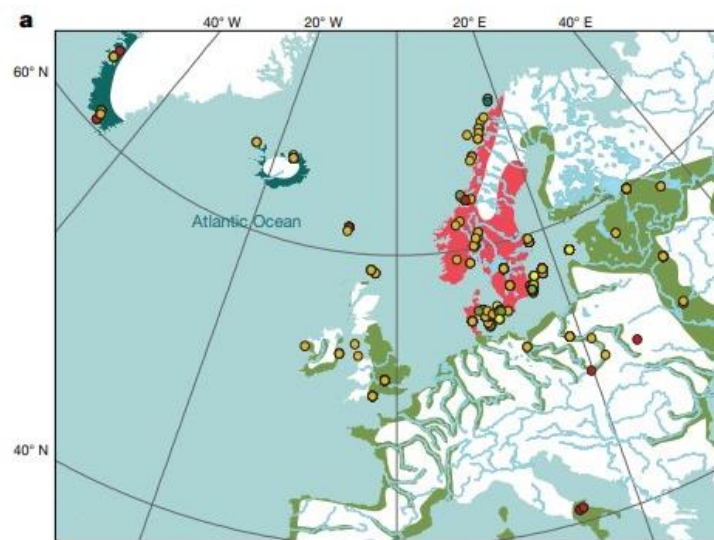


Figure 11: Map taken from Margaryan et al. (2020, p. 391) depicting the Viking World from the 8th to 11th centuries. The sites (circles) are color coded by age whereas the highlighted portions of the map represent different activity regions in which the red denotes Viking origins, green represents areas of raid, settlement and trade, and finally blue depicts pioneering colonization.

The researchers focused less on gene flow into Scandinavia though they do identify this flow as following accepted trade routes in which Baltic and Finnish genetic influence reached what is now Sweden and Gotland but is absent from modern Norway and Denmark. Conversely, western genetic influence from the British-Irish Isles is present in Norway and Denmark where it is largely absent from Sweden. The authors briefly mention influence from southern populations in Denmark and southern Sweden though do not pursue this claim in much detail. Regarding the genetic legacy of the Viking Age today, Margaryan and colleagues posit that most present-day populations resemble their ancient counterparts and that outside of Scandinavia there is consistent, yet limited influence.

This article's genetic data reinforces accepted pathways of movement outside of and into Scandinavia during this time. While some sites exemplified relative homogeneity, the populations in coastal sites were markedly heterogeneous, extending an urbanization model proposed by previous research both spatially and chronologically. The most striking conclusion the authors here hope to offer is a greater complexity to the Viking narrative in which "Vikings were not simply a direct continuation of Scandinavian Iron Age groups" (Rodríguez-Varela et al., 2023, p. 395).

6.2 Analysis and Results

This case study is featured in one of the largest scientific journals, *Nature*. This influential publishing body accepts articles for their originality, importance, interdisciplinary interest, timeliness, accessibility, elegance and surprising conclusions. All of which can be attributed to this case study. There is additional emphasis on providing news content and interpretation of "topical and coming trends affecting science, scientists and the wider public" that is considered as the source materials are dissected (Nature).

6.2.1 Supplemental Material

This publication features extensive, eternal supplemental material, including supplementary data tables and extended data attached at the end of the publication. The extended data is given wider breadth in the supplemental material, so only the supplemental material will be focused upon. Considering its vast quality, a critical analysis of the entirety of information offered is well beyond the scope of this thesis. Only sections that contribute relevant insight into questions regarding media, archaeogenetics, and mobility will be considered. These include sections discussing historical background and contextualization of the samples, a catalog of the archaeological sites from which samples were taken, discussion of spatiotemporal patterns of ancestry, and analysis of complex traits.

The communication of identity in this material is overwhelmingly essentialist even though the samples are often referred to as people or individuals. When discussing the minutiae of sites

across Europe, the burial contexts and the people excavated are done in a way that is summarizing rather than investigative. Consider this example:

“Sacrificed victims buried in the bog of Hundstrup. In total, two adults, two children, and two infants were recovered... Strontium analyses have been done on all of the individuals and show that Sk. 2 (VK297) was non-local” (nature research, 2020, p. 10)

The description offered while neutral, is also reductive. This is because the catalog of archaeological sites is meant as a synopsis and thus exploring the embodiment of identity is beyond the scope of the material. Yet, it is still markedly essentialist in character. The fact that ancient genomes are attributed to single pre-defined ancestry groups in supplementary note 12, namely “UK”, “Denmark”, “Norway”, Sweden”, “Italy”, “Poland”, and “Finland,” provides additional evidence of this essentialization indicating that any additional context neglected in the publication cannot be found in the supplemental information.

The presentation of the Viking Age is considerably more in depth as the supplementary information provides a background history section. This section specifically presents the time period in a rather nationalistic sense. There is strict adherence to framing the Vikings under a homogenized Scandinavia featuring discussion of “colonists of Scandinavian descent” and presentation of the “Scandinavian Kingdoms” (nature research, 2020, p. 2) Additionally, the catalog of archaeological sites is presented under modern political boundaries. There are some distinctions to this mode of conveying the Viking Age in terms of temporality rather than geography or genealogy. The time period assumed to represent the Viking Age is continually referred to as a “convention” stating that the age “does not mark a break from a previous state of isolation, and any genetic developments in the period must be considered on the basis of a long and changing history of interactions in northern Europe” (nature research, 2020, p. 2).

Thus, there is no framework indicative of a consistent characterization of the Viking Age in the supplementary material. This is further evident in the contrasting perspectives used in a single paragraph in supplemental note 12 (Spatiotemporal patterns of ancestry in the Viking World). Here there is clear recognition of the Scandinavian borders as modern constructions stating, “It is

commonly believed that the westward migrations and raids were mainly carried out by people from what are now Norway and Denmark...” (nature research, 2020, p. 141). Yet just in the next sentence ownership of that history is framed using such modern borders in the line “...eastward expansions are commonly believed to have been carried out by Swedish Vikings...” (nature research, 2020, p. 141).

The intentional combination or intersection of media criteria is overwhelmingly absent from the supplementary material. The presence of criteria that are found in this material can be attributed to the nature of communicating archaeological and genetic research (Table 5).

Media Criteria	Margaryan et al. (2020) Supplementary Material
Actuality	Certainty rhetoric overall*
Locality	Present throughout (place names, archaeological site catalog)
Personalization	Comparison to modern populations
Sensation	Potential for use, yet absent

*See deviations below

Table 5: Overview of media criteria in the supplemental material

A rhetoric of certainty is used broadly in the site catalog except when conveying skepticism in the sex or origin of individuals where phrases often use “estimated” or “probably”. Of the 13 sites that discuss the origin of the individuals (the 20 contexts on Öland are discussed as a group thus the same will be done here), 38% communicate uncertainty, 31% certainty, 23% a mix of both, and 8% (just one site) is labeled as indeterminate. Thus, the expression of actuality is quite even but because the site synopsis is predicated on existing research the criteria expressed here cannot be attributed to an orientation of the media. Another example that is lacking certain media criteria is the discussion of complex traits in supplementary note 15, particularly the trait for black hair color. This represented an opportunity to imbue sensation in the results. The researchers concluded that there are significant changes that have occurred in the frequencies of allele for hair color between Viking Age individuals in what is now Denmark and the modern population there. This is done with considerable uncertainty qualifying the conclusion with

phrases like “it appears” or “at the moment we cannot conclude” (nature research, 2020, p. 167). The opportunity for criteria such as actuality or sensation to bolster this claim is not taken.

6.2.2 The Research Article

The broadly essentialist characterization of identity continues from the supplemental material through the publication with some important distinctions. Population groups and their movements are often referred to as “ancestry” attributed to influx into other regions (Margaryan et al., 2020, p. 390). A certain reductiveness of identity characteristic of population genomics carries itself throughout the text when discussing, for example, if ancient individuals share more alleles with “present-day population 1 or with present-day population 2” (Margaryan et al., 2020, 395). The essentialized mode of presenting genetic identity is even more apparent in the attribution of affinities to present-day populations deemed “Danish-like”, “Swedish-like”, “Norwegian-like”, and “North-Atlantic-like” (Margaryan et al., 2020, 391).

Some important deviations from this mode include more in-depth discussion of genetic profiles of specific individuals and what it could mean for their identities. These are namely (1) two ancient individuals from Northern Norway with affinities to present day Saami populations in Scandinavia, (2) two individuals from Orkney buried in Viking fashion, and (3) members of the Salme ship burial who were identified as relatives using kinship analysis (Margaryan et al., 2020, pp. 392-393). These are, however, just a handful of individuals out of the hundreds analyzed and are quite remarkable, lending to closer examination. This indicates that identity is only considered complex and embodied if it stands out from the masses

The conceptualization of the Viking Age in the publication is relatively consistent with the supplementary material, specifically regarding discussion of the historical context. There is a sense of pride attributed with the legacy and global reach of the Viking Age suggesting a nationalist leaning. This is supported by the consistent use of Swedish, Danish, and Norwegian-like ancestry (fig. 12). Yet, this perspective shifts as the conclusions of the research begin to be presented. Such conclusions contribute to a dismantling of the traditional nationalistic narrative regardless of whether it is explicit or not. The last line of the text: “many Viking Age

individuals—both within and outside Scandinavia—have high levels of non-Scandinavian ancestry, which suggests ongoing gene flow across Europe” firmly positions the article within a paradigm shift of Viking studies in which definitions are changing and expanding thus contributing to an anti-nationalist reframing of the period (Margaryan et al., 2020, 395).

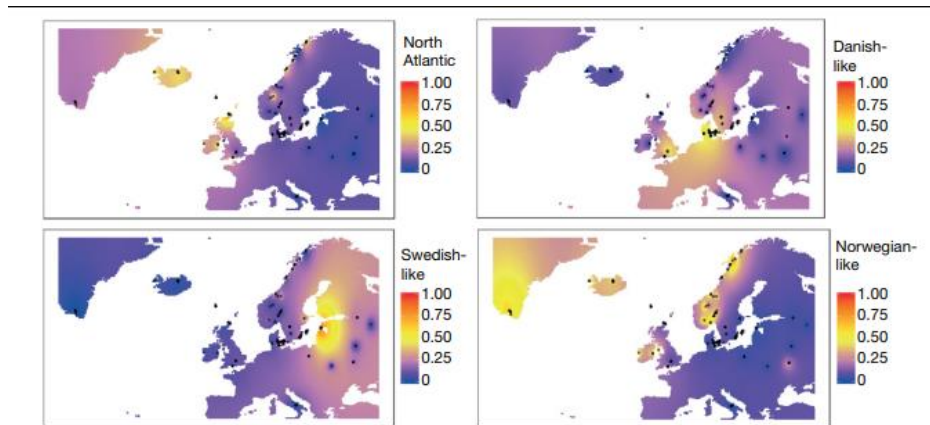


Figure 12: Partial chart depicting spatiotemporal patterns of “Viking” and “Non-Viking” (North-Atlantic-like) in Europe during the study period (Margaryan et al., 2020, p. 394). Note the lack of “Swedish-like” ancestry in what is now modern-day Sweden.

A separation from a traditional or stereotypical perspective can be attributed to more than just the conclusions alone. There is also a recognition of the lack of clarity in preconceptions of Viking identity stating that “it is unclear to what extent the Viking phenomenon refers to people with a recently shared genetic background” demonstrating that the assumption of a continuous homogeneous identity are not expressed throughout the publication (Margaryan et al., 2020, p. 391). Rather, when homogeneity is expressed in Viking Age Scandinavian locations, it is done so in stark contrast geographically referring to a genetically diverse coast versus a homogenous interior. Thus, a nationalist conception of the Viking Age isn’t constructed.

The expansiveness of the Viking world explored in the article is reflected in the importance of locality as the study encompasses much of Europe and Greenland. The clustering of affinities with present day populations creates an interesting intersection with personalization (see fig. 12 again). This intersection of personalization and locality is exemplified throughout, which is more indicative of media orientation, such as in the statement “Within Scandinavia, most present-day populations resemble their Viking Age counterparts” (Margaryan et al., 2020, p. 395). The ratio of phrases surveyed for the criteria of actuality are relatively biased towards certainty (fig. 13).

While much of the rhetoric conveying certainty is necessary for communicating results, there is considerable intersection of these criteria in the latter half of the text where conclusions begin to be drawn.

Actuality Ratio of Surveyed Phrases

Margaryan et al. (2020)

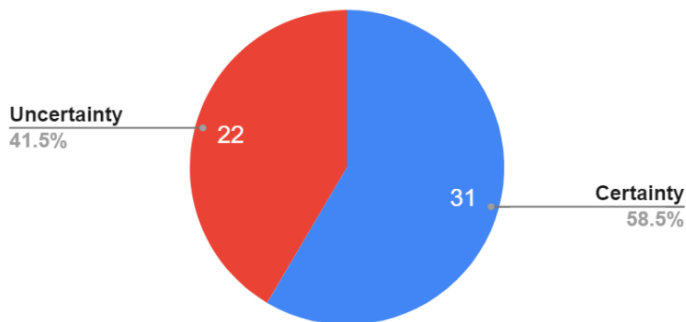


Figure 13 (left): Chart depicting ratio of certainty and uncertainty rhetoric of 50 surveyed phrases. (see appendix III.III for full table).

This is not the case when concluding complex trait evolution, however, which suggests a change over time in the expression of phenotypically dark hair is. Rather, it is communicated similarly as in the supplemental material with little sensation and a sense of actuality framed by uncertainty stating that “currently, we cannot conclude” (Margaryan et al., 2020, p. 394).

The larger conclusions of the text, however, are framed under intersecting media criteria. All four criteria intersect, for example, in the presence of ancient ancestry in present populations. While most present-day populations resemble the Viking Age counterparts in the same region, Sweden is expressed to have only 15-30% “Swedish-like” ancestry, which may be on par with the 10% “North-Atlantic-like” ancestry in the nation (Margaryan et al., 2020, p. 395). The combined use of metrics to convey actuality, personalization and locality in the expression of ancestry, and the implied sensation of findings that debunk traditional preconceptions certainly make for impactful conclusions. The orientation to media criteria is clearly not uniform throughout the text. The condensation of intersecting criteria throughout the final paragraphs of the publication suggests a certain degree of impact that is being anticipated in the larger conclusions that are drawn. This indicates a specific use of media criteria in the most crucial parts of the text, possibly to bolster visibility while leaving them out of the more technical passages of the publication.

6.2.3 Globe Institute Press Release: *World's largest ever DNA sequencing of Viking skeletons reveals they weren't all Scandinavian*

There are three official press releases for Margaryan et al., two from Copenhagen University (one from the interdisciplinary Globe Institute and one from the University Press office) and one from Aalborg University. Because Copenhagen University remains the main academic affiliation with the research, only those two case studies will be focused upon (Appendix IV.II; IV.III).

Identity is presented in this press release as one that is changing and the definition of a Viking as one that is expanding, thus conveying an implicit sense of nuance. The focus is on how the publication “debunks the modern image of the Vikings” (KU Globe Institute, 2020, p. 2). However, there is a somewhat concerning essentialization that occurs throughout the news article. There is a consistent conflation with “Viking DNA” which is essentialist and rather misleading, not to mention particularly sensational and borderline nationalistic. This framing is particularly confusing considering that a main argument of the research is that the role of Viking could be attributed to people who were “not actually genetically” Vikings. (KU Globe Institute, 2020, 3). What then does “Viking DNA” mean when the definition of Viking is expanding? This is surprisingly essentialist and wholly in contrast with what the research is trying to communicate.

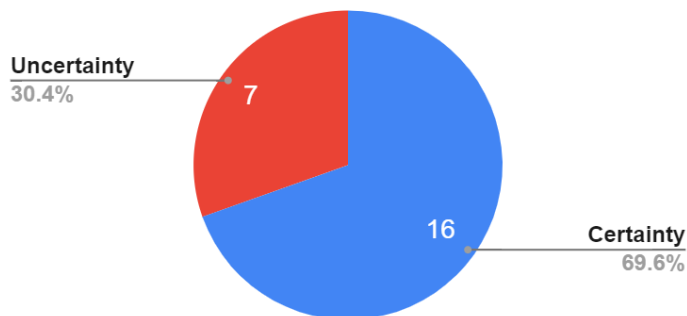
The notion of “Viking DNA” is also attributed to modern populations in the UK where six percent are “predicted to have Viking DNA in their genes compared to the 10 percent in Sweden” (KU Globe Institute, 2020, p. 6). Not only is this essentialized construction of identity prioritized, but the metrics provided are factually incorrect. This six percent of “Viking DNA” is expressed in the publication as “Danish-like” ancestry specifically in England. Further, the authors qualify this metric by saying “it is difficult to assess how much of the Danish-like ancestry is due to pre-existing Anglo-Saxon ancestry” (Margaryan et al. 2020, 395). Crucially, the 10 percent attributed to Sweden is actually in reference to “North-Atlantic-like” ancestry which is distinctly described in the research as “non-Viking” (Margaryan et al., 2020, pp. 394-395). The issues with dissemination of the knowledge generated are undeniable and these issues persist among the other lenses and press releases.

Because the press release is overwhelmingly focused on how the research will “rewrite the history books,” the Viking Age, by a kind of default, is presented in an anti-nationalistic sense where homogeneity is replaced by diversity. The sentiment “... they weren’t all Scandinavian” is immediately communicated by the title of the release and is carried throughout the article in which the Viking is no longer an identity that is “limited to people with Scandinavian genetic ancestry” (KU Globe Institute, 2020, pp. 1-2). People “became” Vikings, it was not just something you were born with (KU Globe Institute, 2020, p. 3). Importantly, there is still a sense of pride attributed to the discussion of Viking history as its conceptualization moves away from a more traditional, national narrative. There is considerable emphasis on how the politics and genetics of Europe and beyond were forever changed, fostering a legacy of the Viking Age that is tangible today.

Criteria of the media are prolific in this text. Actuality expressed through a rhetoric of certainty is represented more than twice as much as uncertainty and it intersects just about all other criteria represented in the press release (fig. 14).

Figure 14 (right): Chart depicting ration of certainty and uncertainty of 21 surveyed phrases (see appendix III.IV for full list)

Actuality ratio of Surveyed Phrases Globe Institute Press Release



Sensation is emphasized from the very start of the text. The reader is constantly reminded of the “startling” results of the research, its “cutting edge” technology and how they, as quoted by Margaryan

himself, “...carried out the largest ever DNA analysis of Viking remains” (KU Globe Institute, 2020, p. 4). Imbuing sensation into the sense of actuality conveyed is particularly powerful especially when bringing in quotes from experts such as the title author of the article. Quotes from other researchers in the release emphasize how the “Viking” identity was not limited to genetic Scandinavians or how the physical appearances of Viking people are now being compared to present individuals (KU Globe Institute, 2020, p. 5). The sense of sensation and actuality attributed to the claim that “Our research even debunks the modern image of Vikings

with blonde hair as many had brown hair...” as quoted by Eske Willerslev, contrasts with how it is presented in the other two source materials indicating how skepticism is not favored in communication to the press even from the authors themselves (KU Globe Institute, 2020, p. 3)

There are considerable other intersections of the media criteria throughout. Actuality and sensation are communicated in the realization that what we were *taught* about Vikings in the “history books” may be far from reality. Sensation and personalization certainly work together in the notion of “Viking DNA” described above as well as in the influence of “foreign genes from Asia and Southern Europe...” which is a phrasing that positions itself precariously in current debates surrounding the immigration of people from outside of Scandinavia bringing their own “foreign genes” (KU Globe Institute, 2020, p. 2).

6.2.4 Copenhagen University Press Release: *Blonde Scandinavians or well-traveled Southern Europeans? New research busts myths about Vikings*

Like the above press release, the bulk of what is communicated in this one is of myths busted, and newfound diversity. When identity is explicitly navigated, it is done in a rather essentialist way, consistent with the material for this case study. The title’s notion of “well-traveled Southern Europeans” for example is not only farfetched considering the research but presents a reductive account of gene flow and migration. There is an additional conflation of “Danish Vikings”, “Norwegian Vikings”, and “Swedish Vikings” in a quote from Margaryan which contrasts with the conclusions of the publication which are ultimately trying to convey some sense of the Viking identity as one that is negotiable (Copenhagen University, 2020, p. 3).

The Viking Age is conceptualized similarly as well. The notion of “busting myths about the Vikings” positions the text in a paradigm shift in Viking studies (Copenhagen University, 2020, p. 1). This is emphasized further by claiming that the stereotype of the Viking (as a nationalistic one) is perpetrated by “films rather than history” (Copenhagen University, 2020, p. 1). This anti-nationalist sentiment, even if not explicit, can be summarized in the impactful quote “...the Vikings may not be quite as Nordic as hitherto believed” (Copenhagen University, 2020, p. 2).

An interesting distinction that occurs is between the “Vikings” and the “peasant societies on the Scandinavian mainland.” This distinction is predicated on the conclusion that genetic diversity was higher in coastal regions compared to relative homogeneity of inland populations.

Margaryan solidifies this distinction by saying “The Vikings lived in coastal areas, and genetically speaking, they were an entirely different people to the peasant societies living further inland” though curiously the separation of Viking populations from the non-Viking Scandinavian populations is absent in the research article itself (Copenhagen University, 2020, p. 2). This is fascinating from a national identity standpoint in which we are beginning to understand that not everyone in Old Norse Scandinavia was a “Viking” in the occupational sense. Yet, which ancient Scandinavian identity remains tied to contemporary Nordic identity? Yet, there is still a sense of pride in Viking history. Eske Willerslev reflects on the romanticization of the Viking Age “because it is our own” and “was indeed something special” (Copenhagen University, 2020, p. 5). This indicates that while preconceptions of the Viking age are experiencing a paradigm shift, ownership of that history isn’t being challenged to a degree consistent with the diversity suggested by the research results.

This is indicative of how the intersection of media criteria is much more suggestive of orientation to those criteria. The title alone *Blonde Scandinavians or well-traveled Southern Europeans? New research busts myths about Vikings* is a remarkable instance of all four criteria, actuality, locality, sensation, and personalization working together to produce an impactful, if not misleading, statement. When viewed in isolation, the ratio of actuality as expressed through rhetoric of certainty or uncertainty is comparably more balanced than the Globe Institute release (fig. 15). Actuality is certainly enhanced by the inclusion of quotes from researchers and expert commentary in both texts. Yet the improved impact of actuality, from a medialized sense, when intersected by the other media criteria still holds true. The use of verbs such as “discard” and “bust” in the phrases “discards popular ideas” and “busts myths about the Vikings” are examples of actuality and sensation working together to produce something impactful. Ideas about the Vikings extending from film and the claim that Vikings may not be so Nordic are clear examples of sensation, and personalization. Sensation is again emphasized in the expanding definition of the Vikings as people with dark hair or non-Scandinavian DNA. The subheading “a Viking on

the outside, a Scotsman on the inside” is certainly indicative of this and intersects with the criteria of personalization and locality as well (Copenhagen University, 2020, p. 3).

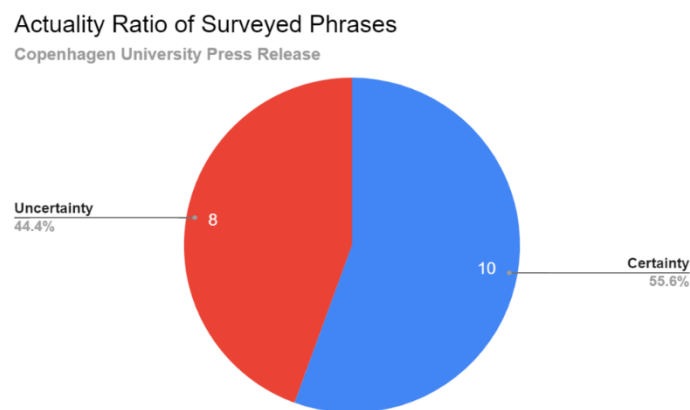


Figure 15: Chart depicting the ratio of certainty and uncertainty in 18 surveyed phrases (see appendix III.V for full list).

6.3 Chapter 6 Summary: Viking World Conclusions

The chapter has presented an overview of the publication *Population Genomics of the Viking World* by Margaryan et al. (2020) and analyzed its medialized production of knowledge and communication of Viking and ethnic identity from an organized, institutional perspective via the publication, the supplemental and extra material provided, and its official press release.

The presentation of identity and conceptualization of the Viking age are largely consistent among three data sources. The essentialization of identity can be attributed to the lack of scope in the supplementary information and the nature of Big Data use and genetic analysis in the publication itself indicative of concerns raised by scholars in previous chapters. However, the research article has demonstrated that among such large data sets, if an ancient individual’s genetic profile is exceptional, greater nuance will be attributed to the construction of their identity so much so that they become a kind of poster child for readers to engage with the research in the press release.

Data, metrics, and percentages, while attractive to the average reader, and symbolic of the kind of value attributed to genetic data, can become diluted as it is translated through supplementary information, the research article, and official institutional press releases to the point where the

numbers provided are at best misleading, and at worst entirely false. It is at this point that researchers must question, regardless of whether or not they have much control over the workings of press offices (or even the direct factually in which they work), to what degree they are responsible for this kind of misinformation. This is true in the presentation of certain sensational findings as well, which may be presented with necessary skepticism as the knowledge is produced but streamlined to certainty in its dissemination.

Notably, it was the Globe Institute's press release that was approved with misinformation, not Copenhagen University's press office. Thus, the streamlining that occurs here cannot be attributed to simply the press offices if the information that they release is not vetted by the researchers who produced that knowledge in the first place. It is indicative of a relationship that needs to change. Researchers and the institutions they work under cannot simply imbue their conclusions with sensation to garner media attraction then remain relatively absent from the dissemination process. The misinformation presented in this case study is not a consequence of media oversimplification of scientific knowledge but is suggestive of an integrated relationship in which institutions and researchers aren't taking full responsibility for their roles in that relationship.

Chapter 7. Case Study 3: Rodríguez-Varela et al. (2023) The Genetic History of Scandinavia from the Roman Iron Age to the Present

This chapter provides an overview of the findings from Rodríguez-Varela et al. (2023) before analyzing the publication alongside its supplementary material and Stockholm University press release. This case is evidence that the phenomenon of medialization acts on a kind of spectrum, proving less influential for this publication. This makes clarifying the relationship that stakeholders would form with this case much more difficult. Identity is presented predominantly essentialist except for very remarkable individuals that are granted more complexity. However, this nuance is lost in the press release. This suggests that an essentialized construction of identity more in line with genetic research translates much easier through the media. Thus, efforts are needed by archaeologists in this multidisciplinary endeavor to ensure press officials communicate findings accurately. Medicalization is less influential in communication of Viking identity as well where the findings, though sensational, are not strongly communicated through orientation to media criteria in any of the three source materials. While using medialization as a lens through which to view the relationship between knowledge and its stakeholders is challenging for this case study, it is still a relatively recent publication. As such, more time is needed to draw more solid conclusions.

7.1 Publication Summary

This final case study represents a Big Data project assessing the genetic history of Scandinavia (using the modern geopolitical boundaries of Denmark, Norway, and Sweden) during a roughly 2000-year time span from approximately 1 CE to 1850 CE. It utilizes both ancient and modern DNA data drawing from 48 new and 249 published ancient genomes and employ genotypes from 16,638 modern individuals from Denmark as well as each county in Norway and Sweden. The individuals from which aDNA was extracted were classified into five periods: Pre-Viking (1–749 CE), Viking (750–949 CE), Late Viking (950–1099 CE), Medieval (1100–1349 CE), and Post-Medieval period (1350–1850 CE) (see fig. 16)

The authors intended to document the chronology and spatial extent of gene flow *into* Scandinavia and investigate the formation of an observed north-south genetic cline, a consistent change in gene frequency across a geographic range, in Norway and Sweden. (Rodríguez-Varela et al., 2023; cf. Sokta, 2008). The researchers used three modern populations as proxies for different European regions. The Irish came to represent the west (British-Irish Isles), Sardinians to represent southern Europe and Lithuanians in the east to represent the Baltics. Their results indicated that these three non-Scandinavian source populations were low in affinity in the Pre-Viking period but higher in the subsequent time periods characterized by a surge of gene flow from the British-Irish Isles during the Viking period, and additional gene from the east during the late Viking period. They also suggest tentatively that gene flow from the east, and to a lesser extent from the British-Irish Isles, was biased towards females (Rodríguez-Varela et al., p. 35).

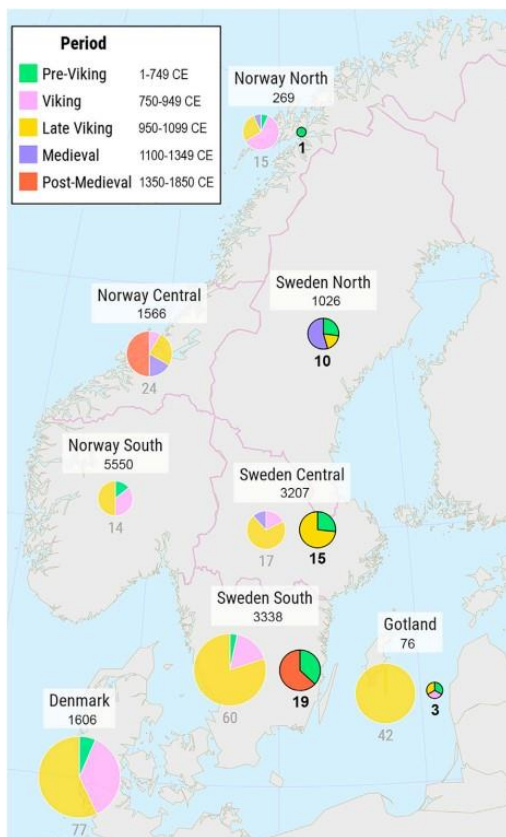


Figure 16 (left) : Map taken from Rodríguez-Varela et al. (2023, p. 34) summarizing the sampling locations of genomes used in the study in which those in bold are new samples and the faded pie charts are taken from existing published data. The bracketed numbers depict the number of modern “Scandinavians” sampled in each region.

In addressing the north-south genetic cline in Scandinavia, Rodríguez-Varela (2023, p. 37) and colleagues explain that the “clinal pattern of genetic variation between northern and southern Scandinavia is primarily due to different levels of Uralic ancestry” in which Finns were used as a Uralic source population. Their results indicate that at least some version of this north-south cline existed at the latest from the Viking period and onward. In sum, their findings suggest that gene flow from the west had a lasting impact on the gene pool in most of Scandinavia beginning as early as the 5th century, much of it likely occurring during the Viking Age. This is consistent with the extent of known Viking Age activity around the British and Irish Isles. Also consistent with historical sources is gene flow occurring

from the east moving into what is now Gotland and central Sweden, though modern populations in these regions show considerably less Baltic ancestry.

7.2 Analysis and results

This article has been published in the title journal for *Cell Press* which emphasizes editorial collaboration characterized by global visibility and discoverability. The findings must be of “unusual significance” and raise “provocative questions” (Cell Press). Thus, even before reading the article, there is a clear anticipation of providing something profound and wide reaching a considerably wide audience.

7.2.1 Supplemental and Extra Material

This case study provides supplemental material that is available for access externally as well as extra material available at the end of the main publication when it is opened online. This is consistent with other *Cell Press* publications. The supplemental material for this case study is only available in the form of a raw data spreadsheet. Thus, the analytical potential for this section lies primarily with the nineteen pages of extra material at the end of the research article.

Eight of these pages describe all the archaeological sites from which materials and samples were taken. Considerable detail is ascribed to the nature of the graves and their inhabitants including how burial positions and material culture suggests different lifestyles and discussion of contradictions that arise between osteological and genetic sex determination of the individuals (e.g. Rodríguez-Varela et al., 2023, e10). This allows for a communication of nuance and breadth of identity not necessarily predicted by the scholars discussed in chapter 2. Yet, it requires readers to look beyond the publication itself suggesting that this nuance is not a priority in communicating the research and is reserved for a background section almost as an afterthought. Thus, Big Data studies such as this one are allowed the text space to discuss identity in a less essentialized way but if it is reserved for just the supplemental material it suggests that the communication of this specific knowledge is not prioritized.

Much of the information available from the extra material does not communicate any specific orientation towards characterizing the Viking Age in a specific way. The summary of

archaeological sites from which material was attained shows that many of the samples have been curated at university and national museums (Appendix II.I). This conveys a sense of national character but is not indicative of specific nationalistic framing.

Evidence of orientation to specific media criteria is similarly lacking in the supplemental and extra material. The information provided by these sources is meant to be a neutral account of the method and material suggesting that the mass media is not an intended audience of this information. As such, sensation is not a tool used in this instance. The extensive account of archaeological material and sites presents a sense of locality for the study and personalization for Scandinavian readers who may recognize the sites or place names. This inclusion of these criteria (locality and personalization) is more indicative of their use in communicating archaeological knowledge rather than orientation to the media. There is a sense of actuality attributed to large data tables and complex figures (see appendix II.II for examples). When considering the aims of the publishing journal regarding engagement in the science community and ensuring the research is “talked about by the right people” the intended audience of the extra material is not suggestive of wider public spheres or the media (Cell). Thus, this sense of actuality is not a result of desiring media visibility but rather the visibility of other genetics or archaeologists as the intended audience of much of the supplementary information.

7.2.2 The Research Article

The conceptualization of ethnic identity in this publication is markedly complex. Essentialization is present considering that individual identities are amalgamated under certain ancestries due to the sheer volume of samples and nature of the research questions. In the study, people are referred under given ancestry/ ancestries some 73 times compared the approximately 46 times they're referred to as individuals. Additionally, the use of specific modern source populations as proxies for larger regions (Irish for the British Isles, Lithuanians for eastern Europe, and Sardinians for southern Europe) represents another form of essentialization. This manifests visually as seemingly complex ethnic identities reduced to colorful shapes on scatter plots (fig. 17).

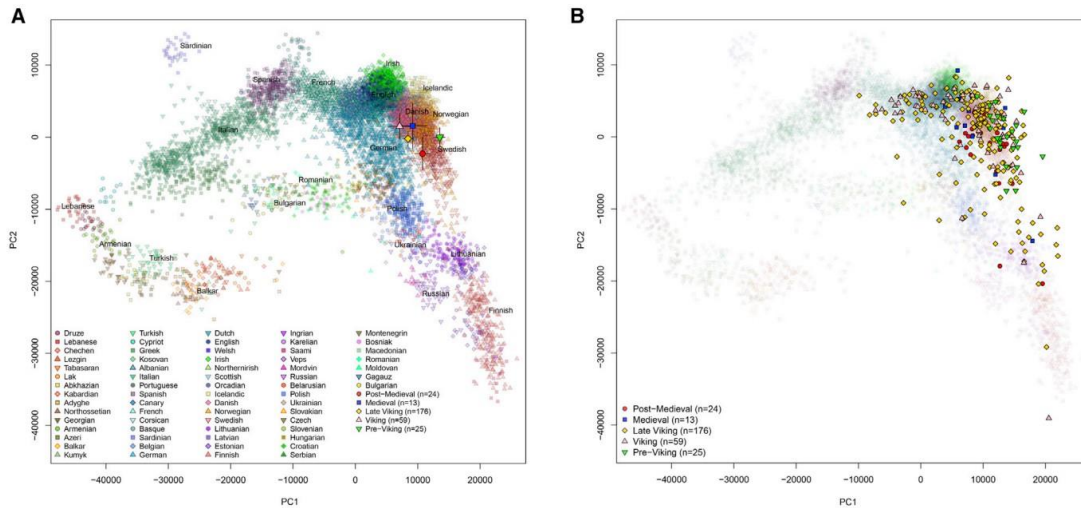


Figure 17: Charts taken from Rodríguez-Varela et al. (2023, p. 35) depicting Genotypes from ancient Scandinavians projected onto the first two principal components of modern West Eurasians. (A) The mean and 95% confidence interval for each ancient group for PC1 and PC2. (B) All ancient individuals from the five different periods

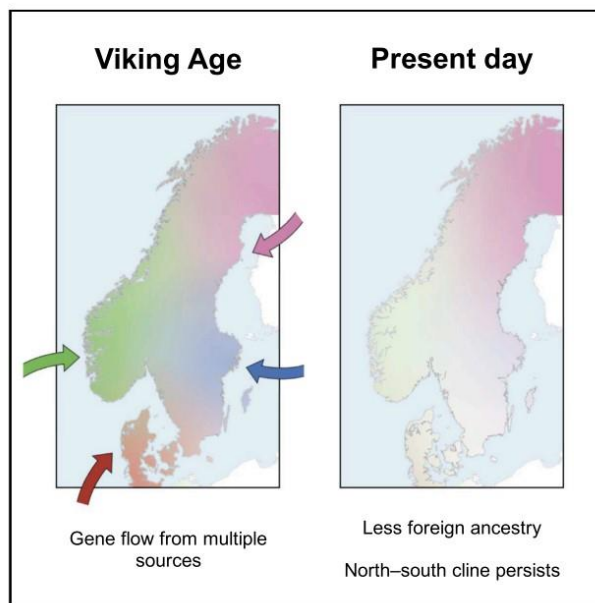
Yet, there is space made in the study to provide context to certain individuals out of the hundreds analyzed. These include (1) a Late Viking period female who genetically appears to be fully British-Irish though clearly had a high status burial, (2) a young pre-Viking period female excavated in Gederup, Denmark also with seemingly British-Irish ancestry, (3) another pre-Viking female this time from Rombäck in Västernorrland in northern Sweden which appears to have some Uralic ancestry present, as well as (4,5,6, & 7) four crewmembers of the warship Kronan with notable levels of Uralic ancestry which fits with historical records indicating recruitment from regions such as northern Sweden and Finland. These seven individuals represent rather remarkable cases which demonstrate why they received a more in-depth and complex evaluation of their identity. Thus, space can be made in Big Data studies in large science journals such as *Cell* to provide some nuance to otherwise essentialized identities if those identities are considered sensational or remarkable.

Rodríguez-Varela and colleagues show considerable bias when examining the conventional period of the Viking age even though study assesses the last 2000 years of genetic history in Scandinavia. This is evident in the graphical abstract on the first page of the text (fig. 18). While the use of modern geopolitical boundaries, in and of itself, does not suggest a nationalistic framing, a consistent and distinct focus on comparing “ancient Scandinavian genomes” with those of modern Scandinavians does (Rodríguez-Varela et al., p. 33). Yet, the nature of their

results indicating a higher degree of non-local ancestry in Viking Age groups alludes to a sense of heterogeneity in this time period that contrasts the continual homogeneity characterized by nationalistic preconceptions of this period and its people.

Figure 18 (right): Graphical abstract from Rodríguez-Varela et al. (2023, p. 32). Positioned just under the title of the article, *The genetic history of Scandinavia from the Roman Iron Age to the present*, the focus communicated will be on comparing Viking Age Scandinavia to the present. Further, the graphic visually communicates an implicit cosmopolitan, melting pot-like tone.

Yet, this conflict between heterogeneity and homogeneity of the gene pool is not explicitly leaned into. The authors do importantly qualify the chronological shorthand label for the “Viking period”, as, “not intended to imply that all individuals from the Viking or Late Viking periods were actually ‘Vikings’ ...” (Rodríguez-Varela, p. 33). Thus, this qualification and the heterogeneity suggested by the article’s conclusions contribute to a dismantling of the nationalistic uses of the Viking Age and Viking identity whether this was explicitly intended by the authors or not.



This anti-nationalist positioning and implied reconceptualization of the Viking age offers the potential for anticipated media visibility. However, orientation to media criteria via their intersection is largely absent from the publication. The nature of the research is characterized by extensive comparison of ancient genomes in Scandinavia to modern ones, indicating that locality and personalization are necessary for grounding the text and establishing relevancy to modern readers. It does not suggest efforts to orient the publication specifically to garner mass media attention.

Of the 66 different phrases and sentences surveyed for actuality (use of certainty or uncertainty), approximately half communicated one or the other (see appendix III.I). Many of the phrases that indicated some sense of certainty are common tools for communicating one’s results with

confidence. More important than confidence when communicating scientific knowledge is knowing when to acknowledge shortcomings in your research. This is achieved by communicating a sense of uncertainty in phrases such as:

- “However, **more data** from ancient individuals from the central and northern regions of Scandinavia are **required** to determine the extent to which the latitudinal shape of the cline developed from the Viking period to the present” (37).
- “It is **not possible to tell from our results** whether the north-south cline existed in some form before the Viking period...” (38).
- “Although our study is based on a relatively large number of ancient genomes, **even more will be needed** to answer such fine-scale questions...” (41).

This balance in the use of actuality communicating both certainty and skepticism when necessary, communicates a sense integrity in the scholarship that is less readily attractive to the media. Thus, the use of actuality in this article is not likely an explicit attempt to orient the research to the mass media. The impactful nature of the article’s conclusions presented an opportunity to be imbued with sensation. However, this criterion is lacking from the publication. For example, a claim from the highlights section of the article states: “Modern Scandinavians have less non-local ancestry than Viking Age samples” (Rodríguez-Varela et al., 2023, p. 31). This claim challenges preconceptions of the Viking Age and its people but is not exploited at an intersection of sensation and actuality that would be favored by the mass media. The use of “non-local” could easily be construed as “foreign” to attract more attention or the whole phrase could be rephrased to emphasize the perceived diversity of Vikings compared to their modern counterparts. Sensation is also avoided by the addition of “samples” reminding the reader that the results are not necessarily being extrapolated to larger populations. This quote suggests that orientation to the media indicative of medialized knowledge production requires explicit use of diction to exploit these criteria for visibility or recognition. This publication represents a case in which orientation to the media does not occur as a result of intentional intersection of media-attractive criteria

7.2.3 Stockholm University Press Release: *DNA from archaeological remains show exceptional migration to Scandinavia during the Viking era*

The way identity is presented in the press release has a markedly essentialist edge in comparison to the supplemental material and the publication. The ancient individuals are simply referred to as “genomes” or “ancestry.” Even when the piece discusses specific sites, such as the warship Kronan, it is in reference to the genomes collected from the site and not the individual crew members as discussed by the publication (Stockholm University, 4) (see appendix IV.I for full text). The specific context that was given to certain individuals in the research article and the extra material is completely absent in the press release. Modern individuals are given somewhat more personhood described as “individuals” from which genetic data was taken. Yet ultimately, nuance in the presentation of identity is not afforded for the press release.

The characterization of the Viking Age is mixed. Conclusions of genetic flow into Scandinavia by the publication that are translated into the press release are markedly anti-nationalistic in a Svanbergian sense in that it acknowledges that this period was not populated by a consistent homogenous group. The bias afforded to the Viking age in the article itself extends to the press release despite the large time scale of the study period. This contrast is evident even in just the two titles of the press release (Stockholm University) and the research article (Rodríguez-Varela et al. 2023) respectively:

- *DNA from archaeological remains show exceptional migration to Scandinavia during the Viking era*
- *The genetic history of Scandinavia from the Roman Iron Age to the present*

This indicates that although the research is framed as a genetic history of Scandinavia, it is exclusively communicated as a genetic history of the Vikings. Thus, the conclusions of the article are expressed in the press release in an anti-nationalistic sense but the ownership of that history still goes largely unchallenged.

While the press release represents a translation of knowledge from the academia to the media, the criteria favored by the media aren't particularly abundant (see Table 6). This is consistent with the reduced presence of media criteria in the publication itself and the considerable lack of it in the extra and supplementary material.

Media Criteria	Stockholm University Press Release
Actuality	9 Phrases: 5 (certainty), 4 (uncertainty)
Locality	Present throughout (place names)
Personalization	Present throughout with specific reference to “well known Swedish archaeological sites” (4)*
Sensation	“exceptional” nature of the study and its “new discoveries” that resolve complexities “to a level never realized previously”

*at the intersection of both personalization and locality

Table 6: Table showing how the different media criteria manifest in the press release. See appendix III.II for the full table of phrases surveyed for actuality

Actuality specifically is expressed similarly to the research article in which just over half of the surveyed phrases feature rhetoric of certainty. Uncertainty, not usually favorable by the media is alluded to in the recognition that “based on the study, the researchers cannot say exactly who it was that came to Scandinavia during the Viking Age” (Stockholm University, 2). Thus, the necessary uncertainty repeatedly emphasized in the publication does manifest even in the press release attesting the importance of skepticism in maintaining integrity during the knowledge production and communication process.

7.3 Chapter 7 Summary: Conclusions from a Genetic History of Scandinavia

This chapter has presented a broad overview of the publication *The Genetic History of Scandinavia from the Roman Iron Age to the Present* by Rodríguez-Varela et al. (2023). It has analyzed its medialized production of knowledge and communication of Viking and ethnic identity from an organized, research institution perspective via the publication, supplemental and extra material provided, and its official university press release.

The construction of identity in this case study is mixed in character. The extra material explicitly provides some space to contextualize the archaeological sites from which samples were taken and to briefly explore the individuals representative of those samples. There is also space made

in the main text of the publication to discuss specific individuals, though there is a sense of reductiveness in this process considering the people who are given context only exhibit remarkable, outlying genetic profiles. Consequently, this essentialized framing of identity as genomes or ancestry is translated extensively into the press release in which space for contextualization is reduced to a bare minimum. This indicates that even if efforts are made to alleviate certain pitfalls in the presentation of identity in aDNA research, these may not be translated to the press release. Thus, if presenting complex and nuanced identities is a priority of the researchers, then efforts must be made to ensure that complexity is translated by the institutions these researchers work under.

The conceptualization of the Viking Age in this material is similarly mixed. In all three sources, there is clear geographic framing within modern geopolitical boundaries. Though, this cannot be indicative of a nationalistic framing of history, especially considering the conclusions of the publication which are implicitly anti-nationalist. The conclusions of the research article force readers to reconsider and expand the definition of the Viking. While this places the material in a paradigm shift in Viking studies, it is far less explicit or sensational in this positioning. As such, this case represents one where medialization is less influential in streamlining the production of Viking Age knowledge making the relationship that readers would develop with this knowledge more difficult to clarify.

The lack of media criteria in the supplemental and extra material is evident that the medialization of archaeological research operates on a kind of spectrum. The presence of such criteria in this case does not suggest explicit orientation towards those criteria. This is indicated by the prevalence of locality and personalization in the materials but lack of sensation that intersects with actuality. medialization is thus less influential in the communication and reception of these results suggesting that the production of impactful knowledge need not be streamlined. Though, it is crucial to note that this study is still relatively recent in its publication and more time is needed to draw more concrete conclusions.

Chapter 8. Discussion: Integrating the Case Studies

This chapter will begin by engaging in a critical comparative discussion of all three case studies to examine similarities and differences in the construction of ethnic and Viking identities through different degrees of medialized knowledge production. This will include a comparison between the use of smaller data sets and Big Data studies to draw insights into how this relationship may contrast. It will then discuss the strengths and shortcomings in using medialization to analyze and clarify the relationship that archaeology (and more broadly science) has with the mass media and politics. With these strengths and shortcomings in mind, this chapter will conclude with a reflection on improvements to be made in similar research moving forward as well as provide suggestions and avenues of change for professional researchers in an increasingly political and medialized world.

8.1 Case Studies in Comparison

The construction of ethnic identity in most of these case studies was largely essentialist with some important exceptions. The first case study, Krzewińska et al. (2018), presents the inhabitants of Sigtuna with complexity and nuance throughout its source material. While this case study appears to be a highly medialized text, it is unlikely that factors such as medialization or possible constraints from the publishing body had much bearing on this presentation. Rather, factors such as the small data size, focus on local and town-specific narratives of migration, and use of analytical methods beyond aDNA all likely contributed to characterizing the Sigtuna inhabitants with a greater sense of personhood. The Big Data case studies, on the other hand, are more stereotypically essentialist in their presentation of ethnic identity. Though similarly, this presentation is much more representative of their vast data sets that feature hundreds of individuals and focus on grand migration narratives rather than influence from the mass media.

There is limited space made in the Rodríguez-Varela and Margaryan texts to attribute more complexity to sampled individuals, but this is reserved somewhat for the supplemental or extra material. Any nuance that is found in the research article or press releases is reflected in sampled

individuals that featured remarkable or sensational genetic profiles. Thus, complexity of identity, at least in these two Big Data studies, can be presented in large science journals such as *Nature* and *Cell* but are restricted to limited members of the population that are not representative of larger society. This choice to focus on sensationalized cases may be indicative of orientation to the media, especially considering that these individuals are highlighted in the press releases for both publications.

All three of these case studies position themselves within a likely paradigm shift in Viking age conceptualization. The ways in which preconceptions of Viking identity are challenged by genetic data in these publications hold considerable media value. This is reflected in the use of sensation and actuality to communicate results. Yet the potential for media attention is not uniformly exploited in all three of these cases. The varying degrees in orientation to media criteria throughout all the case studies and their source materials is evident of this, revealing that although medialization is a more accurate mode with which to view knowledge production and communication, it will manifest differently on a case-by-case basis. This makes clarifying the relationship that these publications have with their stakeholders, and the political discourse they find themselves in, using a meta-analysis of medialization, quite challenging.

Overwhelmingly, the supplemental material provided by these publications showed little evidence of possible bias toward the mass media considering that the intersection of media criteria was largely absent from these sources. This suggests that the intended audience of this material is not the media or stakeholders in the general public. One exception is the Krzewińska case study which combines a sense of actuality and sensation when communicating the ratio of sampled individuals deemed to be non-local extrapolating this ratio to represent that of the whole town. This is done throughout all three data sources indicating a much greater degree of orientation to media criteria compared to the other case studies. Such a heavy medialized influence could be a result of the researchers anticipating the visibility of their conclusions and bolstering their claims with actuality and sensation to capitalize on that visibility. Yet this claim would require additional research not just on the side of the research institution but also the individual researcher, the first level of medialization analysis suggested by Franzen, Weingart, and Rödder (2012).

The small data size represents another possibility for the greater orientation to the mass media and the extrapolation of results compared to the Rodríguez-Varela and Margaryan texts. The latter two case studies were massive research endeavors in both contributors and data pools, framed by one of the press releases as the “biggest genetic study of Vikings ever” (Copenhagen University, 2020, p.2). This would suggest that the impact of these two studies, both on the media and beyond, would require less specific orientation than those media criteria and extensive extrapolation wouldn't be necessary due to the large amount of data available. Additionally, the Krzewińska article was published at a time when genetic studies on mobility, especially in the Viking Age, were largely in their infancy. Each of the subsequent publications borrow genetic data from the former (already impactful) studies. Thus, for a publication like Rodríguez-Varela et al. (2023), which references and uses the other two very media-present case studies, orientation to media criteria to bolster visibility would seem to be less imperative. Considering that this publication is still relatively recent, more time would be necessary to provide a more conclusive comparison.

8.2 Archaeogenetics, Media, Politics

Considering the above comparison, this thesis cannot conclude that solely analyzing medialization can clarify the relationship between archaeology, the mass media, politics, and stakeholder groups. The case studies presented do, however, reveal notable complexities in that relationship that cannot be ignored. The combination of themes present in these publications (genetics as truth, ethnicity and origin, Viking identity) created a volatile mix that lent itself to strong media attention and solid positioning in political discourse even before the articles were released. The anticipation of attention begins prior to this, before the articles themselves were even accepted by the academic journals that published them. Funding bodies expect a certain degree of visibility to ensure money is not being wasted and large scientific journals like *Nature* and *Cell Press* predicate their acceptance criteria on a promise of rapid, global dissemination (Nature; Cell). All of these processes (medialization, pressure from funding bodies, requirements of academic journals) may elicit the use of sensationalized or bold claims that streamline knowledge production for different audiences of stakeholders. Thus, medialization cannot be the

only lens with which to attempt to clarify the tangled relationship between science, its publics, politics, and the media.

If knowledge production and communication is predicated on such a complex system, including medialization, then is the dissemination of an archaeologist's research completely out of their control? Certain factors are, of course. Funding bodies and acceptance criteria for academic journals must be negotiated with. News publications and social media discourse far removed from the academic institution cannot all be resolved of misinformation or misinterpretation. Yet, the different ways in which medialization is operationalized in the case studies investigated by this thesis lead us to question the researcher's role in this process and how that role may be improved. Explicit political engagement by researchers and their institutions, for example, is one such improvement that has received much debate

This thesis takes the stance that political engagement, especially as knowledge production is increasingly medialized, is imperative. Archaeology and certainly archaeogenetics are fields that are "inextricably interwoven with the political" and thus it is a mistake to understate the political complexities of salient themes like Viking and ethnic identity (Little and Zimmerman, 2010, 134). All of the case studies presented in this thesis take a clear political stance on identity and origin even if that engagement isn't necessarily explicit. The possible paradigm shift in Viking studies seen in these publications is consistent with the way in which Viking historical narratives have adapted to the political needs and research material available at different times throughout the last few centuries, and clearly continues to do so today (Croix, 2015, 83). With contemporary European political needs in mind, some scholars have called for explicit political action and even the promotion of grand migration narratives to foster a shared European identity (see Popa, 2019).

While these articles may not necessarily present an answer to these calls, an increasingly globalized world, and an increasingly globalized Scandinavia, may require a new Viking narrative. With these three case studies, the emerging narrative, supported by technical advancements like aDNA analysis, is one in which the Vikings were genetically diverse people, just as we grow more diverse in the present. Thus, the polarized stakeholders who value Viking Age research are perhaps changing as well. The nationalistic narratives of Viking history as

dissected by Svanberg (2003) lend themselves to a more nefarious side of such stakeholders such as the alt-right or white nationalists (e.g. Castel and Parsons, 2017). Two decades later, this reframing of Viking societies as genetically diverse and phenotypically varied lends itself to the other side of that spectrum of stakeholders who value a progressive and diverse Scandinavian national identity.

Does political correctness bias knowledge production in this case? Bernhard Isopp (2015, 3) reminds us that “politicization is not something that necessarily jeopardizes knowledge production... it can mean that perfectly upstanding scientific knowledge has political implications.” These case studies are reflective of this. The Krzewińska text, however, represents a problematic exception which was published amid national elections in Sweden that featured heavy debate surrounding immigration politics (Källén et al., 2019). Research with potentially difficult political consequences should be published. Archaeology should be provocative and tell stories that complicate narratives, histories, and identities as the case studies above do (Gonzalez-Rubial, Gonzalez, Criado-Boado, 2017, 511). Yet, problems arise if this is done so at the expense of transparency in a study’s shortcomings or integrity in communicating its results. The media and political value of Krzewińska et al. (2018) is undeniable, but extrapolating the results and making unsubstantiated claims based on a data set that is too small to support those claims, is not the right avenue for operationalizing that value.

8.3 Glancing Behind, Looking Ahead: Reflection and Avenues for Future Research

Analyzing the medialization of three recent archaeogenetic case studies lacks the depth and necessary complexity to clarify the relationship that the knowledge produced forms with politics, the media, and stakeholder groups. Yet, these publications do allude to challenges and problems in that relationship that must be alleviated. A continued increase in attention from the media is undeniable and inevitable for politically salient research fields such as those discussed in this thesis, especially as they expand and grow informed by new techniques such as aDNA analysis. As such, the medialization of knowledge production will require extra measures to be taken to ensure the integrity of research is maintained and the knowledge produced does not get

misconstrued as inflammatory, “ideological ammunition” for stakeholder groups and the mass media (Furholt, 2020, 25)

This thesis proposes three areas that need improvement revealed by the above case studies. The first suggestion is that researchers representing all facets of the multidisciplinary work that is done must collaborate more effectively with press offices to maintain how the knowledge they produce is to be communicated. Frieman and Hofmann (2019, p. 538) identify how the briefs provided to press officers to write press releases may not be fully understood. Yet, whose responsibility is it to ensure the full understanding of these briefings? Does the responsibility of the scientist in the communication and dissemination of their research end when that brief is handed over to the university press office? The importance of the press release cannot go understated and briefings to press offices must be carefully and explicitly formulated (e.g. Hakenbeck, 2019; Hawks, 2019, 5; Källén et al., 2019). As such, efforts must be taken to ensure that necessary uncertainty is translated throughout the dissemination process, especially considering it is in severe danger of being lost as it is turned over to press offices. Vivaly, great effort needs to be taken to ensure that no misinformation, or worse false claims, makes it into these press releases. How can this be achieved unless greater time and resources are devoted to the collaboration between researchers and the press offices that will be representing them?

This is not to say that researchers should simply write their own press releases. University press officers are specifically trained to write press releases, organize interviews, and talk to journalists, while many researchers (especially those early in their careers) likely are not (Castel, 2021). Thus, in line with the necessity for researchers to vet press releases, there needs to be a system in place that provides researchers, in this case archaeologists *and* geneticists, with the media literacy training needed to interact in an engaging and informed way with the press in order to ensure their research is communicated and engaged with as it was intended. This would lead to a better understanding of the medialized mode of knowledge production and how to avoid accidentally orienting too heavily to the mass media. It may also look like teaching the producers of knowledge clearer ways of communicating to the groups that spread that knowledge to the masses such as how to conduct oneself in interviews or online so that any statements made are reduced of their potential to be misinterpreted or taken out of context.

Even if press releases are produced collaboratively and vetted for misinformation, even if researchers are properly trained to communicate with media officials, and even if integrity is maintained when anticipating and orienting to media visibility, researchers will inevitably lose control of the narratives they produce the farther they are disseminated. The researcher and their institution's responsibility for guiding the narrative of their conclusions should not end once the press release has been published or the last interview has been conducted. To further ensure that archaeological and archaeogenetic knowledge is conveyed in a controlled narrative, greater emphasis and investment must be placed in outreach initiatives. Such initiatives may benefit from a medialized approach considering that this is becoming the mainstream form of knowledge production and consumption.

Education initiatives for the genetic reassessment of a famous Viking grave in Birka, for example, utilized a stop motion animation film at Uppsala University's SciFest. The media platform was used to teach viewers about the findings of Hedenstierna-Jonson et al. (2017) and Price (2019) as well the contributions of aDNA in reconstructing past identity (de Navascués, 2021). Social media engagement also represents an important facet of engagement that is often under looked (Hawks, 2019, p. 5). Social media sites see much engagement with scientific knowledge. Thus, researchers should not ignore its potential both for continued engagement and control of the research narrative as well as be aware of the danger of rapid misinterpretation and even abuse of data if postings are not formulated carefully.

While the research questions of this thesis may not have been able to be fully realized, the case studies did offer possibilities to improve the medialized relationship of archaeogenetics, mass media, politics, and the stakeholders who value such research. The analyzed cases also present opportunities for how the research conducted in this thesis may be improved and built upon moving forward. Future avenues of research should include the investigation of individual communicative efforts, the third level of medialization analysis outlined by Franzen and colleagues (2012). Insights can be drawn from the outside looking in, but structured interviews with the researchers or press office personnel would be able to more fully inform how constraints by publishing or funding bodies influenced their work and how they were navigated. It would also be useful to determine with greater confidence the degree to which media impact and visibility were anticipated by the individual researchers. Lots of claims can be made by

dissecting the way these sources were written but the authors certainly deserve a voice of their own.

Because this voice is often expressed over social media, an analysis of medialization on the individual level should include research on social media engagement which has been lacking from other similar studies (see Källén et al., 2019, 75). The mass media and the political and scientific discourses discussed through that system are inseparable from social media in contemporary society. Thus, the relationship that archaeology (and other scientific disciplines) has with these systems and the stakeholders who interact with them cannot be fully clarified unless the role of social media is considered. This relationship of knowledge production, communication, and engagement is a complex one, far too complex for a simple one-way model. But it remains more complex than just medialization and the three anglophone publications investigated by this thesis. Thus, much more research is needed to understand how we as archaeologists, geneticists, or scientists fit into that relationship.

Chapter 9: Concluding Thoughts

This thesis has engaged in a meta-study that has attempted to clarify the relationship between knowledge production, mass media, politics, and society by using medialization as a lens through which to draw insights from that relationship. This research has shown that medialization acts differently on the three case studies presented and thus, it represents an incomplete mode with which to clarify how the relationship between archaeology, society, media, and politics is changing. The analysis itself is incomplete and requires investigation of the individual communicative efforts of researchers to determine how media criteria were actually anticipated, how funding and journal constraints were navigated, as well as to highlight the relationship between the researchers, their institutions, and the press offices that represented the publications. Medialization is not the only force that influences the production and dissemination of knowledge, deeper understanding is needed to realize which of those forces lie outside of the individual researcher's control, and where greater responsibility must be taken.

The longer the publication has been spread among various stakeholder groups, the less control individual researchers will have of the narratives they produce. Not every news story or social media post can be vetted for misinformation and combated accordingly. However, these case studies do highlight areas of much needed improvement from an individual and institutional standpoint to minimize any damage that may be done as scientific knowledge disseminates. The relationship between researchers and their institutions' press offices must improve to reduce the potential for misinterpretation in press briefings and interviews as well as to ensure that no misinformation makes it into any official press release. As the mode of knowledge production becomes increasingly more medialized and the role of the individual researcher becomes more publicized, specific media literacy training is needed. Lastly, extended engagement with stakeholder groups and social media platforms would allow for greater control of the research narrative as it develops and disseminates.

There is no universal answer for every publication across every research discipline. That much is clear even from just the three case studies investigated in this thesis. They all show different degrees of orientation to the media and consequently construct identity along different lines

influenced by a myriad of factors including the size of their data sets. All three of them, however, position themselves within a possible paradigm shift in Viking Age scholarship in which the identity of the Viking is expanding due to the political needs of this time and the availability of new materials, as well as within a contemporary identity politics of immigration that remains topical in the Scandinavian nations and much of the western world. As such, the medialized production of knowledge is inevitable for disciplines such as archaeology and genetics that garner such a public eye, especially as they work together in cases such as the three discussed in this thesis. Archaeologists and geneticists alike may be put between a rock and a hard place but can't in every case be absolved of the responsibility of getting stuck, especially if data is not communicated with integrity or proper care is not taken to vet press releases. Only time will tell how research such as those discussed above will change and evolve in a growing globalized and media-present world. The relationship that researchers have with how their findings are produced and communicated must also change accordingly.

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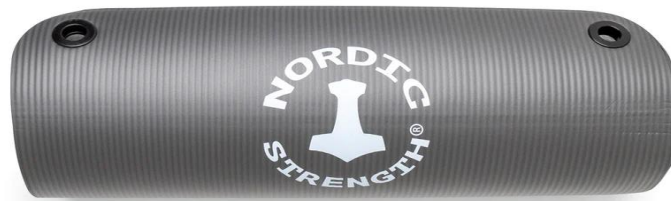
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Appendix I: Examples of contemporary Viking symbolism



Appendix I.I: Yoga mat from the site *billigfitness.se* with a graphic of Thor's hammer and the slogan "Nordic Strength"

<https://billigfitness.se/collections/nordic-strength/products/traningsmatta-1-st-gra>



Appendix I.II: Souvenir shop from Copenhagen's airport with Viking imagery and products on full display.

<https://www.flickr.com/photos/mbell1975/5126912515>

Uploaded to Flickr.com by user mbell1975, October 2010



Appendix I.III: Photo taken from the insurrection of the US Capitol building on January 6th, 2021, featuring Jake Angeli (center), also known as the Qanon Shaman. The mob consisted of white nationalist and alt-right Trump supporters of white Angeli was a prime figure and clearly displayed his Old Norse inspired tattoos.

Photo: Manuel Balce Ceneta/AP, FILE

<https://abcnews.go.com/Politics/doj-video-qanon-shaman-fox-aired-lacks-context/story?id=97830102>

Appendix II: Selected pages and figures from case study publications and supplemental material

Appendix II.I: List of archaeological sites provided in the extra material and location where samples are curated for Rodríguez-Varela et al. (2023). The bias towards Swedish sites is unsurprising considering that approximately 55% of all the ancient genomes utilized in the study hail from around Sweden (and Gotland). The vast majority of those provided in the extra material as located in the Swedish History Museum should be noted.

Site	Curation Location
Alsike	Swedish History Museum
Alstahaug	Norwegian University of Science and Technology, University Museum
Eksta	Swedish History Museum
Enbacken	Swedish History Museum
Frönsön	Jamtli (regional open air museum of Jämtland and Härjedalen)
Fullerö	Swedish History Museum
Gammelbyn	Swedish History Museum
Gannor	Gotlands Museum
Görla	Swedish History Museum
Havor	Swedish History Museum
Kronan	Kalmar County Museum
Rombäck	Swedish History Museum
Sala	Swedish History Museum
Sandby Borg	Kalmar County Museum
Såsta, Broby bro	Swedish History Museum
Sigtuna	Sigtuna Museum
Ströja	N/A (Not yet inventoried as of Jan 2023)
Turinge	Swedish History Museum
Valsgårde	Uppsala University Museum Gustavianum
Valsta	Swedish History Museum
Västerhus	Swedish History Museum

Vendel	Swedish History Museum
Viken, Lovö	Swedish History Museum

Appendix II.II: Example page from Rodríguez-Varela et al. (2023)’s extra material depicting complex charts that convey a sense of actuality even to the layperson reader

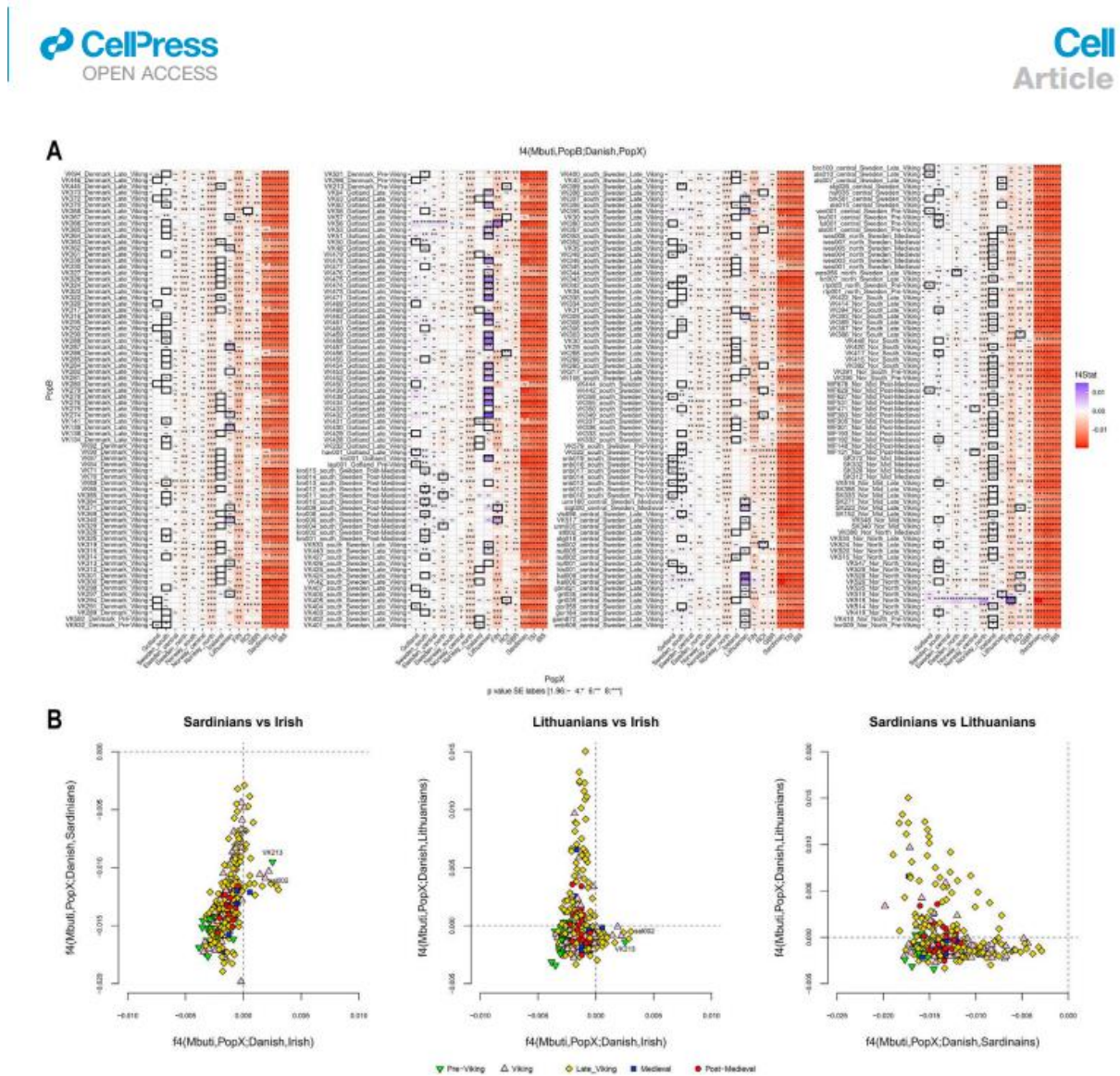


Figure S2. f_4 -statistic analyses on ancient individuals, related to Figure 3

(A) Heatmap. f_4 -statistic of the form $f_4(\text{Mbuti}, \text{Pop B}; \text{Danish}, \text{Pop X})$. Pop X represent modern populations, and Pop B the ancient individuals. The highlighted squares in each row indicate the highest positive value.

(B) Scatterplots of the f_4 -statistic results of the form $f_4(\text{Mbuti}, \text{ancient individuals}; \text{Danish}, \text{modern population 2})$ reflecting the possible correlations of shared genetic drift of each Scandinavian ancient individual with different pairs of modern proxy population.

Appendix II.III: Figure from Krzewińska et al. (2018)'s supplemental material depicting the skeletal material analyzed in the study



Appendix II.IV: Table 1 from Krzewińska et al. (2018, 2732)

Table 1. Summary Statistics Based on Genome Sequence of 23 Individuals from Sigtuna

Sample ID	Location/Burial Site	Genome Coverage	mtDNA Genome Coverage	Mol. Sex	mtDNA Haplogroup	Y Chromosome Haplogroup
84001	cemetery 1 (Nunnan)	×3.7	×108.2	XY	H2a2a1g	N1a1a1a1a1 (N-L392 ¹)
84005	cemetery 1 (Nunnan)	×1.03	×132.2	XY	H1ap1	I1a1b3 (I-Z74 ¹)
84035	cemetery 1 (Nunnan)	×0.2	×149.6	XX	H2a3a	–
nuf002	cemetery 1 (Nunnan)	×0.16	×44.1	XY	T1a1j	ND
kls001	cemetery 2 (Kålsängen)	×0.13	×11.8	XY	H1b1	R1* (R-M173 ¹)
kal006	cemetery 3 (Kållandet)	×1.2	×87	XX	V7a	–
kal009	cemetery 3 (Kållandet)	×0.19	×124.4	XX	T2f1	–
2072	cemetery 4 (Bensinst.)	×0.01	×1.5	XY	U	ND
bns023	cemetery 4 (Bensinst.)	×0.02	×3.7	XX	H4a1a3a	–
gtm021	cemetery 4 (Götes Mack)	×0.43	×34.1	XX	H5	–
gtm127	cemetery 4 (Götes Mack)	×0.06	×11.1	XX	H1a3a	–
97002	mass grave (St. Lars)	×0.12	×27.7	XY	J2a1a (0.6)	R1b (R-312 ¹)
97026	mass grave (St. Lars)	×0.08	×87.6	XY	U5a2a1	ND
97029	mass grave (St. Lars)	×0.07	×34.2	XY	J1c2	ND
stg020	church 1 (St. Gertrud)	×0.18	×59.4	XX	T2	–
stg021	church 1 (St. Gertrud)	×3.4	×136	XX	J1d1b1	–
stg026	church 1 (St. Gertrud)	×0.61	×367.2	XX	J1c2k	–
grt035	church 1 (St. Gertrud)	×3.2	×279	XY	H	G2a2 (G-L1259 ¹)
grt036	church 1 (St. Gertrud)	×2.2	×247.8	XY	H13a1a5	I2a2/2b (I-M436 ¹)
urm045	church 1 (Urmakaren)	×0.09	×74.7	XY	H1a8	ND
urm160	church 1 (Urmakaren)	×1.3	×299	XY	H1q	R1b1a2a1a1 (R-L11 ¹)
urm161	church 1 (Urmakaren)	×0.08	×19.6	XY	T1 (0.4)	A2'3'4
urm035	church 1 (Urmakaren)	×0.26	×240.3	XY	H2a1c	BCDEF

Mol., molecular; ND, not determined. See also Tables S1 and S3, Figures S2–S4, and Data S1.

Appendix II.V: Table S1 from Krzewińska et al. (2018)'s supplementary information

Cemetery*	ID	Sex	DNA Code	DNA sample source	Age	Dating	⁸⁷ Sr/ ⁸⁶ Sr data				Comment
							First molar (36/46)	Second molar (37/47)	Third molar (38/48)	Bone	
Cemetery 1 (Nunnan)	84001	M	84001	C mand sin	M	1055 ±30BP Ua-	0.7143	0.7136	0.714	0.7246	
Cemetery 1 (Nunnan)	84012	M			A			0.7179	0.7198	0.7258	
Cemetery 1 (Nunnan)	84005	M	84005	C mand dx	A		0.7248	0.7253	0.7283	0.7266	
Cemetery 1 (Nunnan)	84002	M	nuf002	M3 sin	A		0.7201				
Cemetery 1 (Nunnan)	84035	F	84035	C mand dx	M	1155 ±30BP Ua-		0.7261			
Cemetery 2 (Kålsängen)	5002	M	kls001	Pars petrosa sin	A		0.7155				
Cemetery 3 (Källandet)	7006	F	ka006	PM2 mand dx	20+		0.7139	0.7137	0.7137	0.7248	M1=Inc **
Cemetery 3 (Källandet)	7009	F	ka009	PM1 mand dx	M		0.7115				
Cemetery 4 (Bensinstat.)	8072	M	2072	M3 mand sin	A	1056 ±35 BP Ua-	0.7422	0.7401	0.7306	0.7296	
Cemetery 4 (Bensinstat.)	8023	-	bns023	Pars petrosa sin	Infant	1060 ±35 BP Ua-				0.7278	F(DNA)
Cemetery 4 (Götes mack)	14004	M			A		0.7248	0.729	0.7286		
Cemetery 4 (Götes mack)	14006	M			M		0.7261	0.7264	0.7271		
Cemetery 4 (Götes mack)	14019	M			A		0.7275	0.7292	0.7208		
Cemetery 4 (Götes mack)	14029	M			A		0.7208	0.7199	0.7197		
Cemetery 4 (Götes mack)	14026	M			A		0.723	0.7185	0.7252		
Cemetery 4 (Götes mack)	14011	-			12-15		0.7104				M1=Can ***
Cemetery 4 (Götes mack)	14021	F	gtm021	C	M		0.7242	0.7264			
Cemetery 4 (Götes mack)	14027	F	gtm127	C	M		0.7102	0.7098	0.7098		
Church 1 (St.Gertrud)	93019	-			17-22		0.7247	0.7277			
Church 1 (St.Gertrud)	83020	F	stg020	Mand sin	A		0.7132				
Church 1 (St.Gertrud)	83021	F	stg021	Mand	A	1020 ±35 BP Ua-	0.7112				
Church 1 (St.Gertrud)	83025	F			A		0.7119				F(DNA) ****
Church 1 (St.Gertrud)	83026	F	stg026	Mand	20+	1115 ±35 BP Ua-	0.7246				
Church 1 (St.Gertrud)	95035	M	grt035	Patella sin	20+	1080 ±40 BP Ua-				0.722	
Church 1 (St.Gertrud)	95036	M	grt036	Mand dx	M	985 ±35 BP Ua-22734				0.7242	
Church 1 (Urmakaren)	90035	M	urm035	Mand dx/sin	M	975 ±35BP Ua-22733		0.7226	0.7243	0.7221	
Church 1 (Urmakaren)	90045	-	urm045	Mt1 dx							
Church 1 (Urmakaren)	90160	M	urm160	Mand dx/sin	M	885 ±35BP Ua-22740		0.7234		0.7243	
Church 1 (Urmakaren)	90161	M	urm161	Humerus sin	I	965 ±35BP Ua-22741					
Church 1 (Urmakaren)	90070	M			A		0.7086	0.709	0.7085	0.7199	
Mass grave (St.Lars)	97025	-			c. 8	1115 ±29 BP	0.7172			0.7238	F(DNA) ****
Mass grave (St.Lars)	97015	M			A	(Ua-17743-Ua-17747)	0.7092			0.7208	
Mass grave (St.Lars)	97011	M			M			0.7108	0.7108	0.7217	

Mass grave (St.Lars)	97016	F			A		0.7177			0.7239	
Mass grave (St.Lars)	97002	M	97002	Femur dx	16-22					0.7215	
Mass grave (St.Lars)	97027	M			A		0.7379				
Mass grave (St.Lars)	97029	M	97029	Femur sin	16-22		0.7241				
Mass grave (St.Lars)	97026	M	97026	C mand dx	A					0.7354	
Humlegården	Pig						0.7185				Tooth
Sigtuna St.Lars	Pig						0.7276				Tooth

M= male, F= female; A= Adultus 20-40 years; M= Maturus 40+, C= complete (90-100%) skeleton, AC= almost complete (50-90%) skeleton, I= incomplete (<50%) skeleton; Dates within parenthesis= other skeletons from the same site; *No strontium data available for individuals urm045 (90045) and urm161 (90161), **Incisive studied instead of M1, ***Canine studied instead of M1, ****Sex assessment, Female, based on DNA.

Table S1. List of analyzed burials and individuals, including summary of osteological, archaeological and burial contexts and $^{87}\text{Sr}/^{86}\text{Sr}$ isotope ratios. Related to Table 1, Figure 1 and Figure 3. The isotope ratios were measured in 36 human tooth enamel and bone and two pig tooth enamel from Sigtuna (sin= left; dx= right; mand= mandible; M1/M2/M3= first/second/third molar; PM1/PM2= first/second premolar; Inc= incisor; C= canine; Mt1= first metatarsal; F(DNA)=female according to the genetic analysis).

Appendix III: Tables of phrases surveyed for actuality

Appendix III.I: Phrases Surveyed from Rodríguez-Varela et al. (2023)

Certainty (34)	Uncertainty (32)
<p>“...resolves the complex relationship between geography, ancestry, and gene flow...” (31)</p> <p>“We find regional variation in the timing and magnitude of gene flow from three sources...” (32)</p> <p>“... British-Irish ancestry was widespread in Scandinavia... whereas eastern Baltic ancestry is more localized to Gotland and central Sweden” (32)</p> <p>“ Finally, we show that a north-south genetic cline...” (32)*</p> <p>“Two studies based on ancient DNA (aDNA) indicate gene flow into Scandinavia during the Viking Age...” (33)</p> <p>“Other studies of modern Scandinavians have described a marked northward increase...” (33)</p> <p>“All the individuals exhibit typical features of aDNA...” (33)</p> <p>“Pre-Viking individuals are significantly different from modern Scandinavians” (34)</p> <p>“The Viking and Late Viking groups are also significantly different from modern Scandinavians on PC1...” (34)</p> <p>“Medieval and Post-Medieval Scandinavians are not significantly differentiated from their modern counterparts...” (34)</p> <p>“...for PC2, Post-Medieval Scandinavians are significantly different from their modern counterparts...” (34)</p> <p>“Our results indicate a surge of gene flow from the British-Irish Isles into Scandinavia during the Viking period...” (34)</p> <p>“We find that affinity to the three non-Scandinavian source populations is low...” (34)</p> <p>“Figure 3A indicates a marked gene flow of eastern Baltic ancestry into Gotland...” (34)</p> <p>“Figure 3B reveals a slightly different pattern of gene flow...” (34).</p>	<p>“Modern Scandinavians have less non-local ancestry than Viking Age samples” (31)</p> <p>“... a drop in current levels of external ancestry suggests that ancient immigrants contributed proportionately less to the modern Scandinavian gene pool...” (32)</p> <p>“...this cline existed in the Viking Age and possibly earlier” (32). *</p> <p>“The ancestry of most modern European populations can primarily be traced, in slightly variable proportions...” (32)</p> <p>“...it is possible to make inferences about the nature and magnitude of the events...” (33)</p> <p>“...most likely due to migration during the Viking period...” (35).**</p> <p>“...the overall magnitude of British-Irish gene flow into Scandinavia appears to have been small...” (35)</p> <p>“...this female is likely to have traced most of her ancestry to the British-Irish Isles” (35).</p> <p>“This finding raises the possibility that VK213 ended up in Denmark...” (35)</p> <p>“...the results shown in Figure 5 provide at least tentative evidence that...” (35)</p> <p>“ We note that these PC distances do not specifically target Uralic ancestry but rather reflect any differences picked up by the PCs” (37)</p> <p>“However, more data from ancient individuals from the central and northern regions of Scandinavia are required to determine the extent...” (37)</p> <p>“Thus, it may be that N1a1 entered Scandinavian populations via the same Uralic gene flow...” (37)</p>

<p>“This points to a lasting and widespread gene flow...” (35)**</p> <p>“... indicating that these two test populations partly capture the same signal of gene flow”(35).</p> <p>“...indicate that these ancestries can be distinguished...” (35)</p> <p>“These conclusions are further supported by the results based on the qpAdm method” (35).</p> <p>“A definitive example of British-Irish gene flow is the Late Viking period female...” (35)</p> <p>“Although our results indicate minimal gene flow... we find one interesting exception...” (35)</p> <p>“We also observe direct evidence for gene flow from the British-Irish Isles through males...” (35)</p> <p>“Figure 6A shows a clear clinal pattern of southward declining Uralic ancestry in both countries...” (37)</p> <p>“...we yet again observe a clinal pattern, with the greatest PC distances in the north” (37).</p> <p>“Is primarily due to differential levels of Uralic ancestry” (37).</p> <p>“In modern Scandinavians, we also see the cline reflected in the geographical distribution of...” (37)</p> <p>“...we observe that six Pre-Vikings (200–520 CE) from four sites in eastern Sweden show less northern affinity...” (38)</p> <p>“...the 13 Viking to Post-Medieval N1a1 carriers are not significantly different to modern carriers...” (38)</p> <p>“...which fits well with our results” (38).</p> <p>“...indicate a major increase during the Viking period...” (38)***</p> <p>“...show that British-Irish gene flow had a lasting impact on all regions of Scandinavia” (40).</p> <p>“The increase of eastern Baltic ancestry in these regions during the Viking Age is consistent with historical sources...” (40)</p> <p>“... mainly due to northwardly increasing Uralic ancestry that was present...” (41)****</p>	<p>“This may indicate a more ancient initial introduction of N1a1 into Scandinavia...” (38)</p> <p>“It is not possible to tell from our results whether the north-south cline existed in some form before the Viking period...” (38)</p> <p>“However, additional individuals from the Pre-Viking period are needed to provide more definitive evidence” (38)</p> <p>“... and a potential bias toward females in the introduction of eastern Baltic and, to a lesser extent, British-Irish ancestries” (38).***</p> <p>“...seems to have had a lasting impact on the gene pool in most parts of Scandinavia” (38).</p> <p>“ This is perhaps not surprising, given the extent of Norse activities in the British-Irish Isles...” (38)</p> <p>“...fate of people of British-Irish ancestry who arrived in Scandinavia at this time are likely to have been variable...” (38)</p> <p>“The situation may have been very different for VK213, a female from Gerdrup...but appears to have been buried without any grave goods” (39).</p> <p>“...our results suggest that most of it likely occurred during the Viking age (39).</p> <p>“Curiously, we see a tendency for the magnitude of British-Irish ancestry to be greater...” (40)</p> <p>“...drop in eastern Baltic ancestry in modern individuals from these regions relative to their predecessors requires further attention” (40).</p> <p>“There are three conceivable explanations for such a large changeover in a relatively short period of time” (40).</p> <p>“ It is thought that cremation was the dominant funerary tradition in Scandinavia...” (40)</p> <p>“Thus, it is possible that the available ancient genomes from the Viking and Late Viking periods...” (41)</p> <p>“Based on current evidence, it is hard to determine which of the three explanations listed above might account for...” (41)</p> <p>“Although our study is based on a relatively large number of ancient genomes, even more will be needed to answer such fine-scale questions...” (41)</p> <p>“...during the Viking period and perhaps earlier” (41).****</p>
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<p>“Overall, however, our study demonstrates that like in the case of so many other human groups...” (41)</p>	<p>“With more ancient genomes from northern Scandinavia, it may be possible to both determine...” (41)</p> <p>See also limitations to the study sentence page (41)</p>
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III.II Stockholm University Press Release for Rodríguez-Varela et al. (2023)

Certainty (5)	Uncertainty (4)
<p>“...resolve the complex relations between geography, ancestry, and gene flow in Scandinavia...” (1)</p> <p>“...indicates that gene flow into Scandinavia was especially intense during this period” (1)</p> <p>“... it was possible to resolve the development of the gene pool to a level never realized previously” (1)</p> <p>“With this level of resolution we not only confirm the Viking Age migration” (Rodríguez Varela, 2)</p> <p>“... and it did indeed prove that a more recent influx of Uralic ancestry...” (Rodríguez Varela, 3)*</p>	<p>“Based on the study, the researchers cannot say exactly who it was that came to Scandinavia during the Viking Age...It may have been...” (2)</p> <p>“The drop in current levels of external ancestry suggests that the Viking-period migrants got less children...” (Götherström, 3)</p> <p>“We suspected that there was a chronology to the northern Scandinavian gene pool...” (Rodríguez Varela, 3)*</p> <p>“But if it is recent, it is comparatively so” (Rodríguez Varela, 3).</p>

Appendix III.III: Margaryan et al. 2020

Certain (31)	Uncertain (22)
<p>“We find the Viking period involved gene flow into Scandinavia...” (390)</p> <p>“We observe genetic structure within Scandinavia...” (390)</p> <p>“We find evidence for a major influx of Danish ancestry into England...” (390)</p> <p>“Additionally, we see substantial ancestry from elsewhere in Europe...” (390)</p> <p>“Our ancient DNA analysis also revealed that a Viking expedition included close family members” (390).</p> <p>“...we find that pigmentation-associated loci have undergone strong population differentiation...” (390)</p> <p>“We conclude that the Viking diaspora was characterized by substantial transregional engagement...” (390)</p>	<p>“Thus, it is unclear to what extent the Viking phenomenon refers to people...” (391)</p> <p>“Overall, our analyses suggest that the genetic makeup of Viking Age Scandinavians...” (391)</p> <p>“... with (inexact and indicative) affinities with present day populations” (391).*</p> <p>“The VK519 individual probably also had Norwegian-like ancestors...” (392)**</p> <p>“... probably owing to geographical barriers that prevented gene flow” (392).</p> <p>“...which suggests an important role for these maritime regions in interaction and trade during the Viking” (392).</p> <p>“...Danish-like ancestry in the British Isles cannot be distinguished from that of the Angles and Saxons...” (392)</p>

<p>“With subtle differences among the groups that indicate complex fine-scale structure” (391)</p> <p>“... which indicates mobility across the Baltic Sea” (391)</p> <p>“...we find that the Viking age individuals from Norway are distributed in a manner...” (391)</p> <p>“... we find that the majority of the groups can be modeled as three-way mixtures...” (391)</p> <p>“These observations are largely consistent with archaeological findings” (391).</p> <p>“We find ancestry components in Scandinavia...” (391)*</p> <p>“We also find that gene flow within Scandinavia was broadly from south to north” (392)</p> <p>“...which indicates genetic contacts between Saami groups and other Scandinavian populations” (392).**</p> <p>“Our results for Gotland and Öland agree with archaeological indications...” (392)</p> <p>“The data indicate genetic diversity on the islands increased...” (392)</p> <p>“Our fine-scale ancestry analyses of genomic data are consistent with patterns documented by historians and archaeologists” (392).</p> <p>“an ancient sample from Gnezdovo in present-day Russia indicates that eastern migrations were not entirely composed of Viking individuals...” (392)</p> <p>“Our results show that ‘Viking’ identity was not limited to individuals of Scandinavian genetic ancestry” (392).</p> <p>“According to our data, the Greenland Norse populations were an admixture between Scandinavians...” (393)</p> <p>“We see no evidence of long-term inbreeding in the genomes of Greenlandic Norse individuals...” (393)</p> <p>“We also find no evidence of ancestry from other populations...” (393)</p> <p>“... which markedly illustrates the mobility of individuals during the Viking Age” (393).</p> <p>“Figure 8b shows that Viking Age groups had very similar allele frequencies ...” (393)</p>	<p>“This pattern is also suggested by isotopic data from a warrior cemetery...” (392)</p> <p>“...are probably the first Pictish genomes published...” (392)</p> <p>“...suggests that Pictish populations may have been integrated into Scandinavian culture by the Viking Age” (393).</p> <p>“This result could favor a relatively brief depopulation scenario...” (393)</p> <p>“This suggests that sexual interaction between the Greenland Norse populations and these other groups was absent or occurred on a very small scale” (393).</p> <p>“...which suggests a relatively genetically homogeneous group of people of high status” (393).</p> <p>“...which suggests a rise in lactase persistence during this period” (393).</p> <p>“...which suggests shared phenotypes between ancient Viking and present-day Scandinavian populations” (394).</p> <p>“...although the latter two were not significant after accounting for the number of tests” (394).</p> <p>“Currently, we cannot conclude whether the observed differences in allele frequencies are due to...” (394).</p> <p>“...which suggests that the signal is not entirely driven by a few large-effect loci...” (394)</p> <p>“It is likely that many such individuals were from communities with mixed ancestries...” (395)</p> <p>“Scandinavia probably comprised a limited number of transport zones and maritime enclaves...” (395)</p> <p>“The high genetic heterogeneity in coastal communities implies increased population size...” (395)</p> <p>“...have high levels of non-Scandinavian ancestry which suggests ongoing gene flow across Europe” (395).</p>
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<p>“...which is consistent with gene flow between the two regions explaining the increasing frequency of lactase persistence in Scandinavia” (393).</p> <p>“Our genomic analyses shed light on long-standing questions raised by historical sources and archaeological evidence from the Viking Age” (395).</p> <p>“We largely confirm the long-argued movements of Vikings...” (395)</p> <p>“However, we also see ancient Swedish-like and Finnish-like ancestry in the westernmost fringes...” (395)</p> <p>“Finally, our findings show that Vikings were not simply a direct continuation of Scandinavian Iron Age groups” (395).</p> <p>“Instead, we observe gene flow from the south and east into Scandinavia...” (395)</p>	
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Appendix III.IV: Copenhagen University’s Globe Institute Press Release for Margaryan et al. (2020)

Certainty (16)	Uncertainty (7)
<p>“World’s largest ever DNA sequencing of Viking skeletons reveals they weren't all Scandinavian” (1).</p> <p>“...from archaeological sites scattered across Europe and Greenland will rewrite the history books” (1).</p> <p>“Many Vikings had brown hair <i>not</i> blonde hair” (2. Original emphasis).</p> <p>“The study shows the genetic history of Scandinavia was influenced by foreign genes...” (2)</p> <p>“...debunks the modern image of Vikings and was led by...” (2)</p> <p>“... but genetically we have shown that it wasn't that kind of world” (Willerslev, 2).</p> <p>“This study changes the perception of whom a Viking actually was...” (Willerslev, 2).</p> <p>We found genetic differences between different Viking populations within Scandinavia which shows Viking groups in the region were far more isolated than previously believed” (Willerslev, 3)</p> <p>“Our research even debunks the modern image of Vikings with blonde hair as many had brown hair...” (Willerslev, 3)</p> <p>“The scientists have also revealed male skeletons from a Viking burial site in Orkney, Scotland, were not actually genetically Vikings...” (3)</p>	<p>“...local people who could have taken on Viking identities and were buried as Vikings” (1).</p> <p>“The genetic legacy in the UK has left the population with up to six per cent Viking DNA” (2).</p> <p>“...Leif Eriksson is believed to have been the first European to reach North America...” (2)</p> <p>“The rest of the occupants of the boat were genetically similar suggesting that they all likely came from a small town...” (Margaryan, 4)</p> <p>“...which suggest ongoing gene flow across Europe” (Sikora, 4).</p> <p>“We can also begin to infer the physical appearance of ancient Vikings...” (Racimo, 5)</p> <p>“...with six per cent of people in the UK population predicted to have Viking DNA...” (5)</p>

<p>“But the research study shows that the Vikings from what is now Norway...” (4)</p> <p>“The results were startling and some answer long-standing historical questions and confirm previous assumptions that lacked evidence” (Margaryan, 4).</p> <p>“We discovered that a Viking raiding party expedition included ...” (Margaryan, 4).</p> <p>“We found that Vikings weren’t just Scandinavians in their genetic ancestry...” (Sikora, 4)</p> <p>“The team’s analysis also found that genetically Pictish people ‘became’ Vikings...” (5)</p> <p>“Importantly our results show that ‘Viking’ identity was not limited to people with Scandinavian genetic ancestry” (Sinbæk, 5).</p>	
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Appendix III.V: Copenhagen University’s press office release for Margaryan et al. (2020)

Certainty (10)	Uncertainty (8)
<p>“New research busts myths about Vikings” (1).</p> <p>“In reality, their genome contains lots of genes from Southern and Eastern Europe...” (1)*</p> <p>“This is revealed by new research from the University of Copenhagen” (1).</p> <p>“The new study also reveals that generally Vikings were a lot more genetically diverse...” (2)</p> <p>“ In fact, they also tend to be dark-haired rather than blond...” (Willerslev, 2)</p> <p>“In fact, they were themselves avid travelers, and historically, we know them best for their plundering...” (3)</p> <p>“The new study also discards what we think we know about who actually went on raids together” (3).</p> <p>“And the new study shows that in some of those places, the inhabitants actually embraced the entire Viking culture” (4).</p> <p>“And the new study not only discards popular ideas about Vikings, from time to time, scientific circles have also discussed the Viking Age” (4).</p> <p>“However, with this new study we’re able to establish that the Viking Age was indeed something special” (Willerslev, 5).</p>	<p>“...which also implies that they had dark rather than blond hair” (1).*</p> <p>“But perhaps part of that narrative is only based on myths and brought to life by popular culture” (1).</p> <p>•</p> <p>“ At least, this is what is indicated by a new study...” (1)</p> <p>...the Vikings may not be quite as Nordic as hitherto believed” (2).</p> <p>“Perhaps they were enemies or perhaps there is some other valid explanation” (Margaryan, 3).</p> <p>“We just don’t know” (Margaryan, 3).</p> <p>“Popular culture suggests that the Viking Chief would recruit the strongest warriors...” (Willerslev, 3)</p> <p>“So perhaps you just brought your family along when you went on a raid” (Willerslev, 3).</p>

Appendix III.VI: Krzewińska et al. (2018)

Certainty (24)	Uncertainty (18)
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“**The data revealed** high genetic diversity among the early urban residents” (2730).

“**The observed variation exceeds** the genetic diversity in distinct modern-day and Iron Age groups...” (2730)

“**Our results uncover** the social system underlying the urbanization process of the Viking World...” (2730)

“**Confirming that** early urbanization processes in northern Europe **were driven by** migration” (2730).

“**This was recently confirmed by** strontium analyses of human remains” (2730).

“**These studies revealed traces** of uniparental Viking legacy...” (2730)

“The material culture in Sigtuna **indicates that the town had intense** international contacts...” (2731)

“...**with most falling within** modern-day variation of Northern Europeans, **with the majority of** individuals encompassing genomic variation...” (2731)

“**Most individuals cluster** together with the single sample from Oxie...” (2731)

“Thus, the **PCA indicated substantial heterogeneity among all** individuals from Sigtuna and even within sites” (2731).

“Eight of the 16 individuals **were confirmed as non-locals** with strontium values...” (2732)

“...six individuals presented strontium values and genetic variation **that agreed with** a local origin...” (2732)

“Thus, by combining the strontium values with the genomic data **we could identify three groups**...” (2732)

“**We found significant variation in** within-group outgroup... **showing less** homogeneity than others...” (2733)

“...the mean within-group outgroup f_3 among all burial location groups... **was higher than would be expected by chance**...” (2733)

“Interestingly, **we found a number of individuals** from Sigtuna to be genetically similar... and most harbor close genetic affinities to...” (2734)

“...**show that 70% of the females and 44% of the males** from Sigtuna were non-locals” (2734).

“The difference in migrant ratios between females and male mobility patterns **was not statistically significant**” (2734).

“Strontium isotope data **suggest mixed local and non-local origin**...” (2730)

“...**showed that some individuals were** of non-local origin...” (2730)

“The town **that is thought to have been** royally founded...” (2731)

“**Some of them may have been used by** kin based groups...” (2731)

“**The burial contexts most likely represent** different groups of town dwellers...” (2731)

“**Some samples show stronger tendencies** toward modern...” (2731)

“...**suggesting migration from** a genetically distinct region...” (2732)

“**These curious cases may be considered** regional immigrants...” (2732)

“**Though speculative it is possible that** the two individuals represent second generation of immigrants” (2732).

“...**as well as two likely** second-generation immigrants...” (2732)

“...**but this slight detected differentiation could not be traced to any two particular groups**” (2734).

“Different sex-related mobility patterns for Sigtuna inhabitants **have been suggested... some female potters in Sigtuna are thought to have** grown up in...” (2734)

“**The observed patterns are best explained by** a scenario in which...” (2734).

“**The long-distance migrants probably moved** to Sigtuna from other centers...” (2734)

“**They most likely represent** the whole network of the Viking world” (2734).

“... **this suggests that the inclusion in them was not** based on kinship” (2734).

“**Therefore, it appears as if** socio-cultural factors, not biological bonds, governed where people were interred (2734).

“**If late Viking age Sigtuna is representative** for those towns...” (2734)

“Hence, no evidence of a sex-specific mobility pattern was found” (2734).

“Our results show that the population of Sigtuna was heterogeneous already during the first 200 years of the town’s existence...” (2734)

“We do not find a specific Scandinavian “Viking” population distinct from the rest of Europe; rather, the population was integrated...” (2734)

“The relatively high genetic and strontium diversity explains the lack of significance...” (2734)

“...burial sites in Sigtuna revealed that individuals from cemetery 1 exhibited significantly lower nitrogen values than those interred in church 1, indicating that...” (2734)

“The genomic and isotope data from Sigtuna paint a picture of a town composed of inhabitants...” (2734)

Appendix IV: Press releases

Appendix IV.I: Stockholm University Press Release for Rodríguez-Varela et al. (2023) - *DNA from archaeological remains show exceptional migration to Scandinavia during the Viking era*



DNA from archaeological remains show exceptional migration to Scandinavia during the Viking era

A new study based on 297 ancient Scandinavian genomes analysed together with the genomic data of 16,638 present day Scandinavians resolve the complex relations between geography, ancestry, and gene flow in Scandinavia – encompassing the Roman Age, the Viking Age and later periods. A surprising increase of variation during the Viking period indicates that gene flow into Scandinavia was especially intense during this period.



Archaeological excavation at Sandby Borg. Photo: Daniel Lindskog

An international study coordinated from Stockholm and Reykjavik investigates the development of the Scandinavian gene pool over the latest 2000 years. In this effort the scientists relied on historic and prehistoric genomes from material excavated in Scandinavia. These ancient genomes were compared with genomic data from 16,638 contemporary Scandinavians. As the geographical origin and the datings were known for all these individuals, it was possible to resolve the development of the gene pool to a level never realised previously.



Ricardo Rodríguez Varela Photo: Mónica Rodríguez Varela

Dr Ricardo Rodríguez Varela at the Centre for Palaeogenetics (<http://palaeogenetics.com/>) *, who analysed all the data and extracted some of the ancient DNA used in the study, explains: “With this level of resolution we not only confirm the Viking Age migration. We are also able to trace it to the east Baltic region, the British-Irish Isles and southern Europe. But not all parts of Scandinavia received the same amounts of gene flow from these areas. For example, while British-Irish ancestry became widespread in Scandinavia the eastern-Baltic ancestry mainly reached Gotland and central Sweden.”

Based on the study, the researchers cannot say exactly who it was that came to Scandinavia during the Viking Age. It may have been slaves/serfs, merchants or diplomats who did not intend to stay or people in church positions who were not allowed to have children and start a family.

The gene pool bounced back after the Viking period

Another new discovery in this study was what happened to the gene pool after the Viking period. The scientists were surprised to find that it bounced back in the direction of what it looked like before the Viking period migration.



Anders Götherström

Photo: Rickard Kilström

Professor Anders Götherström at the Centre for Palaeogenetics, who is a senior scientist on the study, is intrigued: “Interestingly, the non-local ancestry peaks during the Viking period while being lower before and after. The drop in current levels of external ancestry suggests that the Viking-period migrants got less children, or somehow contributed proportionally less to the gene pool than the people who were already in Scandinavia.”

Yet a new discovery was the history of the northern Scandinavian gene pool. There is a genetic component in northern Scandinavia that is rare in central and western Europe, and the scientists were able to track this component in northern Scandinavia through the latest 1000 years.

Dr Ricardo Rodríguez Varela comments, “We suspected that there was a chronology to the northern Scandinavian gene pool, and it did indeed prove that a more recent influx of Uralic ancestry into Scandinavia define much of the northern gene pool. But if it is recent, it is comparatively so. For example, we know that this Uralic ancestry was present in northern Scandinavia as early as during the late Viking period”.

Based on well-known Swedish archaeological sites



Underwater excavations of the ship Kronan. Photo: Lars Einarsson.

The study is based on a number of well-known Swedish archaeological sites. For example, there are genomes from the 17th century warship Kronan, from the Viking and Vendel period boat burials in the lake Mälaren Valley, and from the migration period ring fortress Sandby borg on Öland.

Anders Götherström conclude: “We were working on a number of smaller studies on different archaeological sites. And at some point it just made sense to combine them into a larger study on the development of the Scandinavian gene pool.

The study, published today in Cell, is an international effort with several collaborators, but it was led by Dr Ricardo Rodríguez Varela and Professor Anders Götherström at Stockholm University, and Professor Agnar Helgason, and Kristján Moore at deCODE in Reykavíjk.

*The Centre for Palaeogenetics (CPG) (<http://palaeogenetics.com/>) is a joint venture between Stockholm University and the Swedish Museum of Natural History.

The article “The genetic history of Scandinavia from the Roman Iron Age to the present” ([https://www.cell.com/cell/fulltext/S0092-8674\(22\)01468-4](https://www.cell.com/cell/fulltext/S0092-8674(22)01468-4)) is published in Cell.

Read the article in The Conversation: “DNA reveals large migration into Scandinavia during the Viking age” (<https://theconversation.com/dna-reveals-large-migration-into-scandinavia-during-the-viking-age-197221>)

This research was supported by The Swedish Research Council Project ID 2019-00849_VR and ATLAS (Riksbankens Jubileumsfond).

THEME

DNA Research

History, Archeology and Cultural Heritage

SciLifeLab

Last updated: January 6, 2023

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Appendix IV.II: Copenhagen University's Globe Institute Press Release for Margaryan et al. (2020) - *World's largest ever DNA sequencing of Viking skeletons reveals they weren't all Scandinavian*



Globe Institute

16 September 2020

World's largest ever DNA sequencing of Viking skeletons reveals they weren't all Scandinavian

ANCIENT DNA Cutting-edge DNA sequencing of more than 400 Viking skeletons from archaeological sites scattered across Europe and Greenland will rewrite the history books.



DNA from a female skeleton named Kata found at a Viking burial site in Varnhem, Sweden, was sequenced as part of the study. CREDIT: Västergötlands museum

Invaders, pirates, warriors – the history books taught us that Vikings were brutal predators who travelled by sea from Scandinavia to pillage and raid their way across Europe and beyond.

Now cutting-edge DNA sequencing of more than 400 Viking skeletons from archaeological sites scattered across Europe and Greenland will rewrite the history books as it has shown:

- Skeletons from famous Viking burial sites in Scotland were actually local people who could have taken on Viking identities and were buried as Vikings.

- Many Vikings actually had brown hair *not* blonde hair.
- Viking identity was not limited to people with Scandinavian genetic ancestry. The study shows the genetic history of Scandinavia was influenced by foreign genes from Asia and Southern Europe *before* the Viking Age.
- Early Viking Age raiding parties were an activity for locals and included close family members.
- The genetic legacy in the UK has left the population with up to six per cent Viking DNA.

New perception of whom a Viking was

The six-year research project, published in Nature today, debunks the modern image of Vikings and was led by Professor Eske Willerslev, a Fellow of St John's College, University of Cambridge, and director of The Lundbeck Foundation GeoGenetics Centre, University of Copenhagen.



This study changes the perception of who a Viking actually was – no one could have predicted these significant gene flows into Scandinavia from Southern Europe and Asia happened before and during the Viking Age.

He said: "We have this image of well-connected Vikings mixing with each other, trading and going on raiding parties to fight Kings across Europe because this is what we see on television and read in books – but genetically we have shown for the first time that it wasn't that kind of world. This study changes the perception of whom a Viking actually was – no one could have predicted these significant gene flows into Scandinavia from Southern Europe and Asia happened before and during the Viking Age."

The word Viking comes from the Scandinavian term 'viking' meaning 'pirate'. The Viking Age generally refers to the period from A.D. 800, a few years after the earliest recorded raid, until the 1050s, a few years before the Norman Conquest of England in 1066. The Vikings changed the political and genetic course of Europe and beyond: Cnut the Great became the King of England, Leif Eriksson is believed to have been the first European to reach North America – 500 years before Christopher Columbus - and Olaf Tryggvason is credited with taking Christianity to Norway. Many expeditions involved raiding monasteries and cities along the coastal settlements of Europe but the goal of trading goods like fur, tusks and seal fat were often the more pragmatic aim.



A mass grave of around 50 headless Vikings from a site in Dorset, UK. Some of these remains were used for DNA analysis. CREDIT: Dorset County Council/Oxford Archaeology



Our research even debunks the modern image of Vikings with blonde hair as many had brown hair and were influenced by genetic influx from the outside of Scandinavia.”

Professor Willerslev added: “We didn't know genetically what they actually looked like until now. We found genetic differences between different Viking populations within Scandinavia which shows Viking groups in the region were far more isolated than previously believed. Our research even debunks the modern image of Vikings with blonde hair as many had brown hair and were influenced by genetic influx from the outside of Scandinavia.”

The team of international academics sequenced the whole genomes of 442 mostly Viking Age men, women, children and babies from their teeth and petrous bones found in Viking cemeteries

sequenced the whole genomes of 442 mostly Viking Age men, women, children and babies from their teeth and petrous bones found in Viking cemeteries. They analyzed the DNA from the remains from a boat burial in Estonia and discovered four Viking brothers died the same day. The scientists have also revealed male skeletons from a Viking burial site in Orkney, Scotland, were not actually genetically Vikings despite being buried with swords and other Viking memorabilia.



This rune stone is from Västergötland, Sweden. This is an area where we have many DNA samples from in our study. The runes read "...made this stone after his son Gudmar. He was killed in England";. Interestingly, this connection with England is in line with our DNA findings. CREDIT: Västergötlands museum.

There wasn't a word for Scandinavia during the Viking Age - that came later. But the research study shows that the Vikings from what is now Norway travelled to Ireland, Scotland, Iceland and Greenland. The Vikings from what is now Denmark travelled to England. And Vikings from what is now Sweden went to the Baltic countries on their all male 'raiding parties'.

Dr. Ashot Margaryan, Assistant Professor at the Section for Evolutionary Genomics, GLOBE Institute, University of Copenhagen and first author of the paper, said: "We carried out the largest ever DNA analysis of Viking remains to explore how they fit into the genetic picture of Ancient Europeans before the Viking Age. The results were startling and some answer long-standing historical questions and confirm previous assumptions that lacked evidence. We discovered that a Viking raiding party expedition included close family members as we discovered four brothers in one boat burial in Estonia who died the same day. The rest of the occupants of the boat were genetically similar suggesting that they all likely came from a small town or village somewhere in Sweden."

DNA from the Viking remains were shotgun sequenced from sites in Greenland, Ukraine, The United Kingdom, Scandinavia, Poland and Russia.

Vikings with high levels of non-Scandinavian ancestry



"We found that Vikings weren't just Scandinavians in their genetic ancestry, as we analysed genetic influences in their DNA from Southern Europe and Asia which has never been contemplated before."

Professor Martin Sikora, a lead author of the paper and an Associate Professor at the Centre for GeoGenetics, University of Copenhagen, said: "We found that Vikings weren't just Scandinavians in their genetic ancestry, as we analyzed genetic influences in their DNA from Southern Europe and Asia which has never been contemplated before. Many Vikings have high levels of non-Scandinavian ancestry, both within and outside Scandinavia, which suggest ongoing gene flow across Europe."

The team's analysis also found that genetically Pictish people 'became' Vikings without genetically mixing with Scandinavians. The Picts were Celtic-speaking people who lived in what is today eastern and northern Scotland during the Late British Iron Age and Early Medieval periods.

Dr Daniel Lawson, lead author from The University of Bristol, explained: "Individuals with two genetically British parents who had Viking burials were found in Orkney and Norway. This is a different side of the cultural relationship from Viking raiding and pillaging."

The Viking Age altered the political, cultural and demographic map of Europe in ways that are still evident today in place names, surnames and modern genetics.

Professor Søren Sindbæk, an archaeologist from Moesgaard Museum in Denmark who collaborated on the ground-breaking paper, explained: "Scandinavian diasporas established trade and settlement stretching from the American continent to the Asian steppe. They exported ideas, technologies, language, beliefs and practices and developed new socio-political structures. Importantly our results show that 'Viking' identity was not limited to people with Scandinavian genetic ancestry. Two Orkney skeletons who were buried with Viking swords in Viking style graves are genetically similar to present-day Irish and Scottish people and could be the earliest Pictish genomes ever studied."



The results change the perception of who a Viking actually was. The history books will need to be updated."

Assistant Professor Fernando Racimo, also a lead author based at the GeoGenetics Centre in the University of Copenhagen, stressed how valuable the dataset is for the study of the complex traits and natural selection in the past. He explained: "This is the first time we can take a detailed look at the evolution of variants under natural selection in the last 2,000 years of European history. The Viking genomes allow us to disentangle how selection unfolded before, during and after the Viking movements across Europe, affecting genes associated with important traits like immunity, pigmentation and metabolism. We can also begin to infer the physical appearance of ancient Vikings and compare them to Scandinavians today."

The genetic legacy of the Viking Age lives on today with six per cent of people in the UK population predicted to have Viking DNA in their genes compared to 10 per cent in Sweden.

Appendix IV.III: Copenhagen University's Press Office Release for Margaryan et al. (2020) - *Blonde Scandinavians or well-travelled Southern Europeans? New research busts myths about Vikings*



News

16 September 2020

Blonde Scandinavians or well-travelled Southern Europeans? New research busts myths about Vikings

VIKINGS Our notion of the Scandinavian Viking very likely stems from films rather than history. In reality, their genome contains lots of genes from Southern and Eastern Europe, which also implies that they had dark rather than blond hair. And within the Scandinavian borders, the Vikings did not really mix genetically; instead, they travelled abroad on plundering raids. This is revealed by new research from the University of Copenhagen.



Rune stone from Västergötland, Sweden. This is an area where the researchers have used many DNA samples in their study. The runes read "...made this stone after his son Gudmar. He was killed in England."

When we talk of Nordic history, it is all but impossible not to mention the Vikings. Stories about the Scandinavian warriors and their Old Norse Gods have long since travelled all around the world. But perhaps part of that narrative is only based on myths and brought to life by popular culture. At least, this is what is indicated by a new study from the University of Copenhagen.

The study is the biggest genetic study of Vikings ever. The researchers have sequenced the genome of 442 bone fragments from the Viking Age, from all over Europe, and they have made some rather surprising discoveries. Among other things, the Vikings may not be quite as Nordic as hitherto believed.

“The Vikings had a lot more genes from Southern and Eastern Europe than we anticipated. They frequently had children with people from other parts of the world. In fact, they also tend to be dark-haired rather than blond, which is otherwise consider an established Viking-trait,” Professor at Lundbeck Foundation Center for Geogenetics at the Globe Institute at the University of Copenhagen, Eske Willerslev, explains.

Peasants missed out on the Bronze Age

The new study also reveals that generally Vikings were a lot more genetically diverse than the peasant societies on the Scandinavian mainland.

“The Vikings lived in coastal areas, and genetically speaking, they were an entirely different people to the peasant societies living further inland. The mainland inhabitants had a lot less in common with the Vikings than the peasants who lived in Europe thousands of years ago. You could almost say that genetically speaking, the peasants missed out on the entire Iron and Bronze Age,” co-author of the study and Assistant Professor at the Center For Geogenetics at the Globe Institute, Ashot Margaryan explains.



DNA from a female skeleton named Kata found at a Viking burial site in Varnhem, Sweden, was sequenced as part of the study. Credit: Västergötlands museum.

However, the Viking's diverse genome stems not merely from people from elsewhere travelling to their settlements. In fact, they were themselves avid travellers, and historically, we know them best for their plundering and murdering raids abroad. But this genetic study sheds new light on who went where.

"The Danish Vikings went to England, while the Swedish Vikings went to the Baltic and the Norwegian Vikings went to Ireland, Iceland and Greenland. However, the Vikings from these three 'nations' only very rarely mixed genetically. Perhaps they were enemies or perhaps there is some other valid explanation. We just don't know," Ashot Margaryan says.



The vikings were known for pillaging around Europe. But they did not go the same places. The Danish vikings went to England, the Swedish vikings went to the Baltic and the Norwegian vikings went to Ireland, Iceland and Greenland. Illustration (University of Copenhagen)

A Viking on the outside, a Scotsman on the inside

The new study also discards what we think we know about who actually went on raids together. Researchers have been able to find out more about this at a gravesite in Estonia, where raiding Vikings were brutally murdered.

"Popular culture suggests that the Viking Chief would recruit the strongest warriors from neighbouring tribes or communities to join him on a raid somewhere. But at least five of the Vikings in this grave are closely related. So perhaps you just brought your family along when you went on a raid," Eske Willerslev explains.



A mass grave of around 50 headless Vikings from a site in Dorset, UK. Some of these remains were used for DNA analysis. Credit: Dorset County Council/Oxford Archaeology.

Vikings were not always murdered though; they fared better in other places. In England, by way of example, it has been possible to trace an influx of people from Scandinavia by studying language and specific place names. And the new study shows that in some of those places, the inhabitants actually embraced the entire Viking culture.

"In Scotland there's a grave, which in archaeological terms would be classified as a Viking grave. Its swords and symbols reflect the Viking culture. However, genetically speaking, the man in the grave has nothing in common with the Vikings. He is an example of how the Viking culture was embraced in certain places," Eske Willerslev elaborates.

And the new study not only discards popular ideas about Vikings, from time to time, scientific circles have also discussed the Viking Age.

“Some researchers and intellectuals have been of the opinion that in the North, we have a tendency to romanticize the Viking Age, because it is our own, and a very specific history. They have argued that the Viking Age wasn’t really an Age at all, but rather part of the Iron Age. However, with this new study we’re able to establish that the Viking Age was indeed something special. The Vikings travelled much farther, had lots of Southern European genes and were very likely part of a much more extensive cultural exchange with the rest of the world than any contemporary peasant society,” Eske Willerslev concludes.

Read the whole study “[Population genomics of the Viking world](#)” in Nature. The study has been funded by the Lundbeck Foundation.

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Stockholm
University

Half the population of the Viking-town Sigtuna were migrants

New analysis of the remains of 38 people who lived and died in the town of Sigtuna during the 10th, 11th and 12th century reveals high genetic variation and a wide scale migration. The study is the largest of its kind so far in Sweden and a combination of several methods, including DNA analysis and Strontium isotope analysis of teeth. The results are published in a new article in *Current Biology*.



Adult male, Sigtuna, buried in the 11th century. Discovered in 2008.

Sigtuna is well known as one of the earliest actual cities in the area and was formally founded around 980 AD. More unknown is the fact that the picturesque town, which today is home to around 10 000 people, was a distinctly cosmopolitan place back then. Researchers at Stockholm university, in cooperation with Uppsala University, Middle Eastern Technical University in Turkey, the British Geological Survey in the UK, and Curt-Engelhorn-Zentrum Archäometrie in Germany, have analyzed the remains of 38 individuals from six different burial sites in Sigtuna. The analysis is based on a combination of methods from archeology and osteology, including DNA analysis and Strontium analysis of the teeth (isotope and level of Strontium in teeth varies depending of where the individual

lived in their youth). The results are clear: around half the population of Viking age Sigtuna originated from outside Mälardalen.

- We're used to thinking of the Vikings as a travelling kind, and can easily picture the school books with maps and arrows pointing out from Scandinavia, as far as Turkey and America, but not so much in the other direction, says Maja Krzewinska, researcher at the Archaeological Research Laboratory, Stockholm University and primary author behind the study.

Roughly half of the individuals examined grew up in or around the Sigtuna area. The other half is equally divided in to regional immigrants (from southern Scandinavia, Norway and Denmark) and long-distance immigrants from further away: the British Isles, Ukraine, Lithuania, northern Germany and other parts of central Europe. The immigration to Sigtuna was common for both males and females. Approximately 70 per cent of the female population was immigrants, compared to 44 per cent of the men.

- The archaeological record from Sigtuna never ceases to fascinate as it shows such a wide variety of cultural expressions. And here we see who grew up there and who moved to Sigtuna, says Anna Kjellström, osteologist at Stockholm University and one of the authors of the study.

- I especially like that we find 2nd generation immigrants among the buried, that kind of migratory information has never been encountered before as far as I know, says Anders Götherström, one of the leaders of the ATLAS-project in which this study was conducted.

Similar studies even further back in history would be very difficult, since before the arrival of Christianity the deceased were normally cremated, thus leaving insufficient material for DNA analysis.

The article *Genomic and Strontium Isotope Variation Reveal Immigration Patterns in a Viking Age Town* is published in *Current Biology* on August 23 2018.

The article is found here [https://www.cell.com/current-biology/fulltext/S0960-9822\(18\)30844-3](https://www.cell.com/current-biology/fulltext/S0960-9822(18)30844-3)
([https://www.cell.com/current-biology/fulltext/S0960-9822\(18\)30844-3](https://www.cell.com/current-biology/fulltext/S0960-9822(18)30844-3))

Last updated: August 27, 2018

Source: External relations och communications office (<https://www.su.se/english/research/half-the-population-of-the-viking-town-sigtuna-were-migrants-1.397433?mode=su-contact-editor&editor=functionAddress>)

Bookmark and share (<https://www.addthis.com/bookmark.php>) Tell a friend

(<https://www.su.se/english/research/half-the-population-of-the-viking-town-sigtuna-were-migrants-1.397433?mode=su-form-tell>)