




Archaeogenetics in Popular Media

Contemporary Implications of Ancient DNA

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Abstract

If most academic debates surrounding the recent boom of ancient DNA (aDNA) so far have concerned conflicting research epistemologies, this article is a call for taking aspects of media and communication more seriously. Analyzing the fates of two recent research papers on Viking Age Scandinavia, we show how aDNA research is communicated, narrated and infused with meaning in the public sphere, particularly in relation to popular narratives and political debates. We observe significant interlacing of scientific, political and media discourses in and around the papers, and conclude that archaeogenetics is a highly mediatized scientific field.

Keywords: genetics, aDNA, communication of science, mediatization, viking, female warrior, migration, Birka, Sigtuna

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Introduction

Ancient DNA has lately emerged as an important source of information for historical research. With promises to rewrite history and revolutionize archaeology, and with a rhetoric of certainty allowing results to be presented in terms of truth, proof and evidence, research on ancient DNA (aDNA) has attracted significant scientific and public interest (de Chadarevian 2010; Hagelberg 2013; Samida & Feuchter 2016; Callaway 2018; Lewis-Kraus 2019). However, it has also stirred critical debate in academic archaeology, where concerns have been raised over interpretative simplification and criticisms have been directed at presentations of aDNA results that tend to ignore or overwrite decades of important research in the social sciences and humanities (Sørensen 2014, 2017; Ion 2017; Furholt 2018). Although such critiques are important and well founded, they have primarily been concerned with issues arising from conflicting epistemologies and methodologies within the research community. In this article we will instead focus on the communicative aspects of aDNA research. Our arguments are founded on the observation that knowledge and meaning around aDNA is not only produced in universities and laboratories, but in wide-ranging conversations between a variety of actors and media.

This is a call for taking aspects of media and communication more seriously when we talk about archaeological research with broad public impact (see also Welinder 1997; Holtorf 2004; Clack & Brittain 2007; Henson 2013; Sørensen 2014; Sayer & Walters 2016; Toon & Stone 2017). Awareness of the public realm is essential if we wish to understand the dynamics and cultural implications of aDNA, not least its evident entanglement with contemporary popular and political discourses. How is aDNA research communicated, narrated and provided with meaning in the public sphere? This is an urgent matter, since politically invested interpretations of aDNA can be presented as neutral information due to the perceived authority and objectivity of genetics. In reality however, genetic codes do not tell and share stories; people do, and they do so above all in the media.

The popular appeal of archaeogenetics – archaeological research based on genetics – is evident from the broad spread of popular narratives referring to aDNA, ranging from bestselling non-fiction books (e.g. Bojs 2015; Reich 2018) to adaptations and highly engaged discussions on blogs and in social media. This suggests that the narratives spun from aDNA do not simply provide disinterested, molecular data about people from the past, but contain interpretations that more or less explicitly encourage and engage in present-day political debates and conflicts of interest, particularly regarding identity (Nash 2004; Samida & Feuchter 2016; Hofmann 2016).

To investigate how aDNA research is communicated, narrated and provided with meaning in the public sphere, we will use two recent research papers on Viking Age Scandinavia published by a team of researchers in archaeology, osteology and genetics connected to the prolific ATLAS project at Uppsala and Stockholm Universities, and illustrate and analyze their media landscapes in the form of two network graphs. This will be followed by an analysis of the meaning-making processes involved, with particular focus on how elements of aDNA research feed into and become part of popular narratives and debates.

Analytical framework: popularization, mediatization and celebrity science

Our approach to aDNA research is akin to social and cultural studies of science (e.g. Latour 1987; M'charek 2005). The analytical framework for this article borrows from research in Science and Technology Studies (STS) with a specific focus on the public communication of science (e.g. Rödder et al. 2012; Bucchi & Trench 2014).

In a seminal STS article from 1990, Stephen Hilgartner challenged the dominant view of popularization illustrated by a two-stage model, where 'pure, genuine scientific knowledge' is first formed and later spread to the public via popularization in simplified and distorted forms. Hilgartner (1990) criticized this prevalent view for giving a false sense of linear and hierarchical relations between scientific expertise and popularization, and for its inaccurate distinction between true and pure science on the one hand, and vulgar popularization on the other. As an alternative, he proposed a more flexible 'upstream–downstream' model (Hilgartner 1990). It acknowledges a variety of communication forms, expertise and media, along a continuum from the science 'upstream' to the popular 'downstream'. With this model he wanted to illustrate that even if there are obvious differences between an article in a science journal and one in a newspaper, and even if there is a sense of direction in the communication, popularization 'is a matter of degree' (Hilgartner 1990:528). Although perspectives like this are prevalent in current STS research, the traditional view of a pure science hermetically sealed from distorted popularization is still widespread among scientists, science administrators and science policy-makers (e.g. Bucchi & French 2014; Franzen et al. 2012:10). It has been argued that this view is attractive to these groups because it offers them positions of power and prestige by emphasizing the authority of scientific knowledge and demarcating it from the knowledge of laymen (Hilgartner

1990; Franzen et al. 2012:10). However, the failure of such distinctions to account for the actual intertwinement of science, media and popular culture has become increasingly evident as the science–media connection has grown stronger and more complicated with new forms of mediated interaction and expertise.

Our analytical framework is aligned with recent studies of science communication, where popularization is understood not as external to the scientific production of knowledge, but rather as an integrated part of it. Consequently, the validity of scientific claims is subject to social negotiation and dialogue, rather than imposed unilaterally by scientists. Thus popularization is not to be understood as a certain category of text separated from the realm of scientific inquiry, but as a process that is integral to science. This, in turn, opens up questions about the actors, institutions, and forms of authority involved in science communication (Myers 2003; Schäfer 2014; Kohlenberger 2015).

The public impact of aDNA research can in many ways be seen as paradigmatic for the intensified relationship between science and the media that has been discussed in terms of a ‘mediatization of science’ (Weingart 1998). This relationship involves an increasing media attention to scientific issues, and at the same time an increasing orientation of science towards the media. The result is an intimate entanglement of scientific, political and media discourses. This alignment of science is, among other things, indicated by the arrangement of press conferences and other public events, through pre-publication of results in the media, and by consideration of the criteria and frameworks of the media in publication strategies and in the rhetoric of scientific articles. The process of mediatization, says Simone Rödder (2009:453–454), means that ‘scientific institutions as well as scientists increasingly orientate themselves towards public and media attention rather than the truth’. As such, the concept of mediatization challenges a conventional view of popularization as the spread of simplified versions of scientific facts to lay audiences.

The implications of a mediatization of science seem particularly palpable in the field of genetics, where scientific claims to objective truth are combined with an exceptional visibility in the media (Nash 2004; Hilgartner 2012; Scully et al. 2013). It appears that for aDNA research, the sense of evidence and objectivity offered by genetics is further amplified by a long-standing relationship between archaeology and the media based on the popular appeal of skeletons, treasures, and Indiana Jones-style adventures (e.g. Holtorf 2004; Clack & Brittain 2007). In view of the fundamental interplay between aDNA research and the media, Elizabeth Dobson Jones (2017:16) has argued that archaeogenetics ought to be understood in terms of a ‘celebrity science’, that is, a science ‘that evolves within a shared con-

ceptual space of professional, press and public expectations that contribute to the shaping of the science', and is pursued and produced in a dialectical process that involves scientists as well as members of the media community.

In our analysis of the two stories of Viking Age Scandinavia we focus in particular on aspects of media orientation at the level of actors (cf. Hilgartner 2012). We investigate how the two papers and the researchers behind them, with support from research institutions and research infrastructure, have interacted with and manifested orientations to the media. How, by whom and in what media were these two cases of aDNA research presented as meaningful and engaging stories? What contemporary discourses and political debates did they activate and attract, and at what point? Were there particular narrative elements in the original research articles that sparked further interpretations? In other words: what do the popular discourses around these two cases tell us about the contemporary implications of ancient DNA?

THE BIRKA WARRIOR

On 7 September 2017, an article with the title 'A female Viking warrior confirmed by genomics' was published in *American Journal of Physical Anthropology* (Hedenstierna-Jonson et al. 2017). The article presented the results from DNA and strontium isotope analyses of samples from a human skeleton uncovered in 1878, along with two horses and the typical equipment of a warrior, in grave Bj 581 in the excavations at the Viking Age town of Birka, Sweden. The main results of the DNA and strontium isotope analyses were that all the analysed bones belonged to the same individual, that the biological sex was female, and that she was probably not born in Birka. The results were presented as a correction of previous interpretations, which had assumed that the biological sex of the skeleton was male due to its association with the elaborate warrior's equipment in the grave assemblage. This assumption had been made despite two earlier osteological assessments which indicated that the skeleton belonged to a woman (Hedenstierna-Jonson et al. 2017:857). The concluding discussions in the article emphasized the identification of the skeleton's biological sex, and 'caution[ed] against sweeping interpretations based on archaeological contexts and preconceptions' (Hedenstierna-Jonson et al. 2017:858). The article ends with the recital of a Greenlandic poem:

Then the high-born lady saw them play the wounding game,
 she resolved on a hard course and flung off her cloak;
 she took a naked sword and fought for her kinsmen's lives,
 she was handy at fighting, wherever she aimed her blows.
 (Larrington 1996, in Hedenstierna-Jonson et al. 2017:858).

THE SIGTUNA IMMIGRANTS

On 23 August 2018, about a year after the first article, a team consisting mostly of the same researchers published the article ‘Genomic and Strontium Isotope Variation Reveal Immigration Patterns in a Viking Age Town’ in *Current Biology* (Krzewińska et al. 2018). The article presented the results from DNA analyses of samples from 23 skeletons, and strontium isotope analyses on 16 of the same individuals from an early Christian cemetery in the Viking Age town of Sigtuna, also in the Lake Mälaren region of central Sweden. The results of the DNA analysis indicated a high degree of genetic diversity among the analysed skeletons; these data were compared with observed diversity in Iron Age and modern age groups from central and Northern Europe. The authors interpreted their findings as evidence for migration as a strong driving force in the urbanization of northern Europe. The strontium isotope analysis indicated that eight of the 16 individuals were ‘non-locals’ (Krzewińska et al. 2018:2732). According to the article, the results from the DNA and strontium analyses together distinguished three groups: ‘the locals’, ‘regional immigrants’, and ‘long-distance immigrants’. In addition, there were two individuals who in comparison with population-genetic databases indicated affinities with ‘Norwegian and Ukrainian gene pools’. This observation led the authors to the conclusion that ‘[t]hough speculative, it is possible that the two individuals represent second generation of immigrants’ (Krzewińska et al. 2018). At the end of the article, the scientific analyses were contextualized and interpreted in relation to archaeological material such as ceramics. The article ends with the following statement:

[Sigtuna] represents a single node within a network of similar urban hubs located in various parts of northern Europe at the time. 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. 2018:2734).

Mapping media landscapes

The public sphere in which knowledge about the Birka warrior and the Sigtuna immigrants was created, maintained and shared consists of a variety of media forms (figure 1 & 2). The nodes on the figures represent all items from a three-month period that could be retrieved from searches on Google and the Swedish Media Archive. The nodes are arranged temporally around the original article at the centre, with the first ring representing the

first day, the second ring the next day, et cetera. The left-hand sides of the graphs contain nodes in Scandinavian languages, and the right-hand sides are anglophone. The graphs have been restricted to these two language spheres. The nodes have been colour-coded according to medium or genre: purple nodes are academic articles, green are feature articles, orange are notices, red are films, grey are brief mentions in other items, brown represent audio, and blue are social media. In addition to these there are pink nodes representing interviews. They have been included (although they are not a separate media type) to mark distinct inputs of information that do not come from other media types. The nodes are connected to other nodes with edges representing references (thin) and direct copy (bold). Nodes which have many connections are represented in larger font.

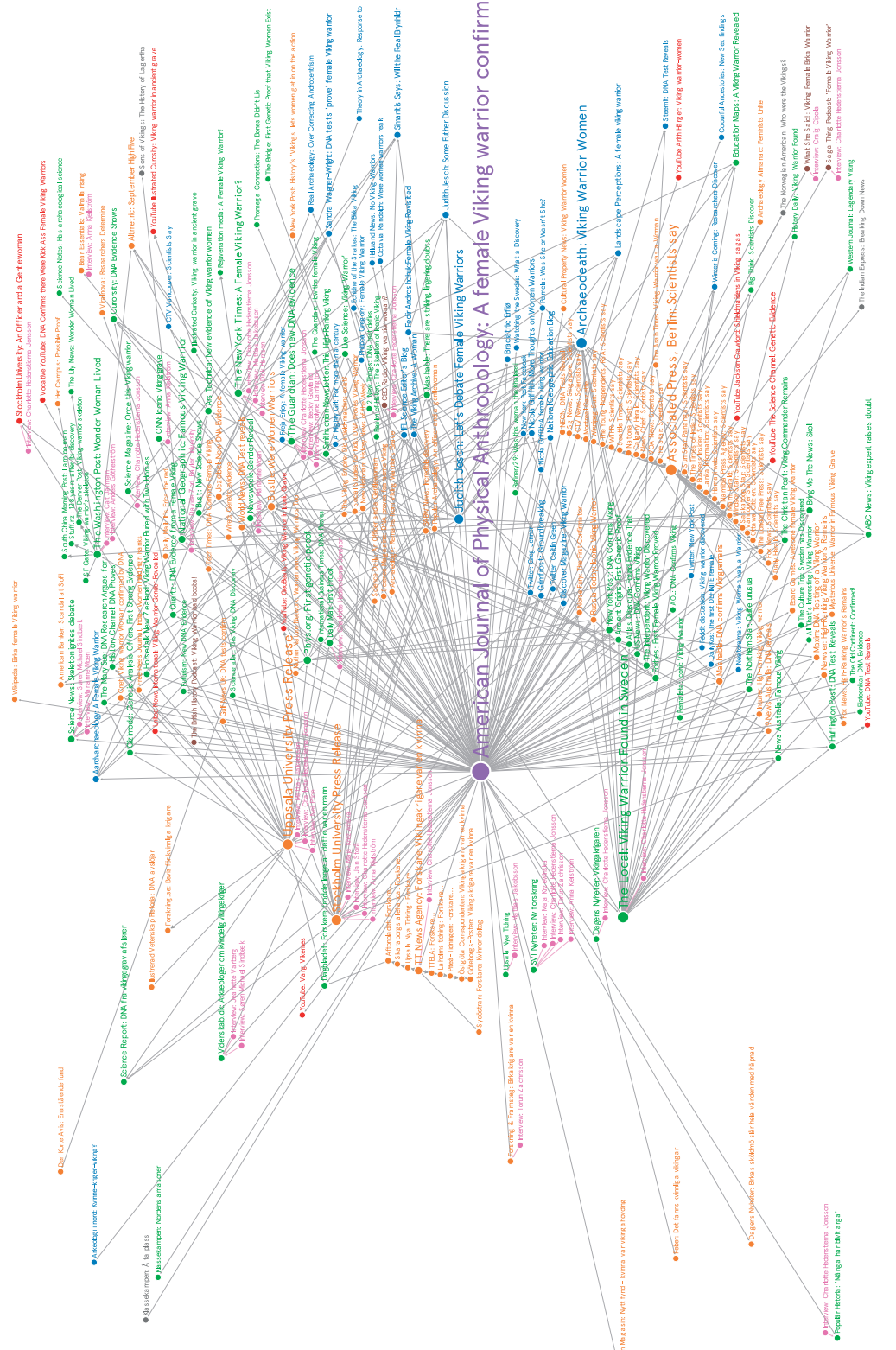
One limitation of the analysis is that we have left out most parts of the social media sphere and interactive public engagement, such as below-the-line commentary (see Sayer & Walters 2016). Further, while we recognise that different media outputs may have different weighting (an international news article is likely to have a greater reach than a local audio piece), we do not codify differences in audience numbers or analyse likely readerships. Still, the graphs reveal the active involvement of various media, such as news agencies, major newspapers, local newspapers, web news sites, scientific magazines, web magazines, blogs, museums, university press releases, film and television, podcasts, and radio, in entangled landscapes of intrinsic relations, in which the original peer-reviewed article is one among many providers of meaning and context. For discussion, we have selected texts and images from both news and social media nodes that represent prominent features and recurring themes.

THE BIRKA STORY EVOLVES

Only hours after the first article was published in the *American Journal of Physical Anthropology*, the story of the Birka warrior exploded into a public supernova. Within a week from the first press release it had generated around 400 press clippings in international news media – from CNN to *Al-Jazeera* and *Le Matin* (Hallman 2017). The Altmetric Attention Score provides a weighted approximation of the digital attention a research output receives, and in October 2018, a little over a year after its publication, the Birka warrior paper was ranked 278 out of over 12 million research outputs tracked by Altmetric thus far, making it in terms of media attention one of the most successful research outputs ever recorded.

The network graph in figure 1 (interactive at <https://graphcommons.com/annakallen>) covers three months of media activity, from 7 September to 6 December 2017. Several significant patterns stand out from this graph. One is the complexity of storytelling around the Birka warrior. It is clearly

American Journal of Physical Anthropology: A female Viking warrior confirmed



not a question of a unidirectional spread of information from academic research centre to lay periphery. Much like Hilgartner's (1990) upstream-downstream continuum discussed above, we see that while the original article and other, non-peer-reviewed, scientific sources (such as blog posts or interviews with scientists) have an upstream (here central) position, there are many other actors and media involved in the process.

The graph shows that a number of important nodes dominate the media landscape surrounding the Birka warrior. Apart from the academic article, which is by far the most important node, we have on the Scandinavian side the Swedish national news agency TT, the press releases from Uppsala and Stockholm Universities, and *The Local*, an English-language news site that reports from non-anglophone countries. The press releases (published both in English and Swedish) and *The Local* are major providers to the anglophone side of the graph as well. There we have a number of influential nodes: The news agency AP, *National Geographic*, *The New York Times*, *The Washington Post*, *The Guardian*, and Phys.org.

There is a notable difference between the Scandinavian and anglophone side. The story died quickly in Scandinavia, where there were only a few nodes after the first day. In the anglophone sphere the story stayed alive much longer. There we see quite convoluted story-telling relations a couple of weeks after the original article was published, after which it started to wane. Moreover, we see many more direct references to the original article on the anglophone side than the Scandinavian, where it was more common to reference a university press release, the national news agency, or a major newspaper.

Importantly, in many of the key nodes on both sides, more information was added to the story by interviews with the researchers. This effectively means that the researchers were not only active at the node of the peer-reviewed academic article, but provided more contextualizing and interpretative information as the story evolved in the media. In *The Local*, for example, one of the researchers is quoted saying: 'It's actually a woman [...] and fairly tall too'. 'She's most likely planned, led, and taken part in battles' [...] 'It was probably quite unusual [...], but in this case, it probably had more to do with her role in society and the family she was from' (Nordström 2017). Another researcher said to the *Washington Post* that 'We were blinded by the warrior equipment' [...] 'The grave-goods shout "warrior" at you, and nothing else'. He concluded: 'Simply super cool' (Nutt 2017). These interpretative additions from the researchers played a key role in the

< Figure 1. Network graph representing three months of media activity connected with the article 'A female Viking warrior confirmed by genomics'. See interactive version at graph-commons.com/annakallen.

media landscape, and were often picked up and recited as the story evolved. With their personal and enthusiastic tone, the researchers added important arguments and sentiments to the results presented in the academic article.

On the anglophone side there are a number of influential blog nodes, and most significant of these is the post ‘Let’s Debate Female Viking Warriors Yet Again’ by Judith Jesch (2017a), Professor of Viking Studies at the University of Nottingham in the UK. This text takes a critical stance towards the interpretations in the academic article. Posted two days after the original article was published, it proved to be a pivotal point in the story of the Birka warrior. If the stories presented in the first two days had been straightforward reports of scientific news augmented with positive interviews with the researchers, Jesch’s critical post generated a new form of story featuring an academic battle with political undertones: a polemic debate for and against the idea of actual female warriors in the Viking Age. The change of direction for the story also changed the conversation patterns in the media landscape on the anglophone side, and Jesch’s (2017a) blog post became the prime mover for the intricacy that can be observed in the upper right quarter of the graph.

THE SIGTUNA STORY EVOLVES

The formation of the story about the Sigtuna population has been mapped in the network graph in figure 2 (interactive at <https://graphcommons.com/annakallen>). The entire graph covers three months, between 23 August and 22 November 2018.

Just as in the first graph, we see that meaning is formed around this research result in more complex ways than a unidirectional spread from academic centre to lay periphery. Yet the Sigtuna graph is very different from that of the Birka warrior – most significantly perhaps in that it is smaller and less complex. Moreover, the Sigtuna story was hardly mentioned at all in anglophone media, and it died quickly on the Scandinavian side as well. Unlike the Birka warrior graph, the original article is not the most significant node, and there are remarkably few qualitative references to it. The dominant nodes are, in this case, the press release from Stockholm University and a short article by the Swedish news agency TT. The title of the press release in Swedish: *Hälften av vikingatidens invånare i Sigtuna var invandrare* (English: Half the population of Viking Age Sigtuna were immigrants; Stockholm University 2018), was widely spread and copied in the majority of the nodes. Both the TT story and the press release quoted

Figure 2. Network graph representing three months of media activity connected with the article ‘Genomic and Strontium Isotope Variation Reveal Immigration Patterns in a Viking Age Town’. See interactive version at graphcommons.com/annakallen. >

interviews with the researchers, and a few of these were widely copied in other nodes: ‘The Swede doesn’t exist genetically’, Sigtuna ‘was like the Shanghai or London of Viking Age Scandinavia’, and ‘I especially like that we find second generation immigrants’ [our translation], where the latter adds a significant emphasis to the argument of the academic article, where the phrasing ‘second generation immigrants’ was cautioned and cushioned by words like ‘speculative’ and ‘possible’. In these cases, quotes from interviews made after the publication of the academic article have been foundational for the development of news stories.

One factor that may have impacted on the fate of the Sigtuna story in Sweden was that the article was published only weeks before the national elections, where the campaigns had been characterized by heated polemics on questions of migration, integration and Swedish identity.

Just as Jesch’s (2017a) post had considerable effect on the media landscape for the Birka warrior, we see a similar change in conversation patterns in the Sigtuna graph, in this case generated by the blog Allmoggen. Here, a critical reading of the original article pronounced that the claim ‘half the population were immigrants’ had no actual backing in the research results, and that it was basically ‘fake news’ (Sjöberg 2018). This conclusion was spread, mostly by conservative chroniclers and on social media, and it also had a significant impact on the major newspaper *Dagens Nyheter*, which subsequently revised its first article and published a disclaimer that blamed the news agency TT for making unsubstantiated claims. Soon after this turn of events, the story was dead on the Scandinavian side, and – unlike the story of the Birka warrior – never gained traction in anglophone media.

Contemporary discourses and debates

In recent research, a number of international studies have highlighted the *social* or *historical* aspects of genetics – that is, the fact that the analyses and employments of DNA are always embedded in existing social practices and discourses (e.g. M’charek 2005; Nash 2015; Nelson 2016; TallBear 2013). As Kimberly TallBear (2013:4–5) puts it, molecular sequences ‘have not been simply uncovered in human genomes; they have been conceived in ways shaped by key historical events and influential narratives’. For the Birka warrior and the Sigtuna immigrants, this means that the meaningful stories around them have been produced in complex interactions between the DNA analysis and wider political or cultural discourses. In temporal terms, genomic sequencing does not necessarily *precede* such discourses in the sense that scientists first analyse a string of DNA and then interpret it. Rather, all available studies indicate that the very analysis is predicated on

already existing discourses (e.g. M'charek 2005; Nash 2015; Nelson 2016; TallBear 2013).

In the case of the Birka warrior, the research is inseparably connected to contemporary feminist and gender discourse. Already in the title of the academic article – ‘A female Viking warrior confirmed by genomics’ – genetics is juxtaposed with allusions to themes of female empowerment and subjectivity. In the very first lines of the article, references are made to ‘narratives about fierce female Vikings’ said to have been prevalent in medieval art and poetry (Hedenstierna-Jonson et al. 2017:853). After a methodological discussion and a technical presentation of the strontium and aDNA analyses conducted by the research team, the authors go on to argue that the skeleton represents ‘the first confirmed female high-ranking Viking warrior’ and moreover, that ‘[q]uestions of biological sex, gender and social roles’ were complex during the Viking Age (Hedenstierna-Jonson et al. 2017:857–858). Closing the article with the Greenlandic poem cited above, the authors seem to imply that the ‘narratives about fierce female Vikings’ referred to in the very beginning of the piece have now been proven historically accurate. While they do not explicitly refer to feminist ideas or disclose any interest in such theory, their entire argument is formulated in relation to themes of female agency and enfranchisement. The very choice to analyse this particular skeleton – which had been judged female on osteological grounds in two previous studies – indicates an orientation towards questions of gender and female agency. In light of this, it can be argued that the DNA sequences bear little, if any, meaning in themselves. It is primarily in relation to a contemporary feminist discourse that they gain a wider significance.

The connection to feminist discourse becomes even more apparent in the media communication. Apart from brief references to the ‘DNA analysis’ or ‘DNA evidence’, very little attention is paid to the genetic analysis itself (and there is almost no mention of the buried person’s proclaimed non-local origin). Instead, the Birka warrior quickly becomes a cudgel in polemics about feminism. While *The Guardian* calls for a revision of male-centred Viking historiography and *Huffington Post* deplors ‘sexism in research methods’ (Cocozza 2017; Vagianos 2017), less established media outlets make bolder claims. A video from the producer Vocativ, for instance, features a medley of pop-cultural images of fierce fighting women accompanied by bombastic music and a text that reads:

Women kick ass. That we know. But now there’s evidence that there were in fact female warriors hundreds of years ago. Researchers re-examined a well-known grave from the Viking Age in the Swedish town of Birka. And DNA tests revealed that this warrior was female. [...] [T]his female warrior also had a gaming set, indicating that she worked on battle tactics and strategy and was

likely an officer. Proving, among other things, that women have been multi-tasking since at least the 8th century. (Vocativ 2017).

On the other side of the debate, commentators seek to frame the findings along misogynist lines. On his YouTube channel, the Norwegian Nazi and neo-pagan Varg Vikernes questions the findings on the basis that women 'are [physically] inferior' to men and that 'it would not be logical to train women to become warriors' (Vikernes 2017). On the Swedish online forum Flashback, self-styled historians deplore 'the poisonous ideology' of feminism and suggest that the skeleton belonged to a prostitute who was buried as a warrior (e.g. Siegester 2017).

If the production of meaning in the case of the Birka warrior is inseparably tied to feminist discourse, the article mapping Sigtuna's immigration patterns is informed by contemporary discourses on migration and ethnicity. Framing the analysis with distinctly modern-day concepts like 'migration', 'second-generation immigrants', 'mobility' and 'urban hubs', the authors formulate their findings in terms that echo ongoing political debates about immigration to Europe. Considering that the strontium and DNA analyses conducted by the research team included a little over twenty individuals from one single cemetery in a town of around a thousand inhabitants – even if we include their use of statistical techniques of population genetics – the authors seem to make quite bold statements when they claim that 'the [Viking] population was integrated in the northern European gene pool at the time', and that the people of Sigtuna should be regarded as 'a cosmopolitan group' (Krzewinska et al. 2018:2734).

The jump from a fairly limited number of skeletons to large concepts like 'Viking population' and 'cosmopolitan group' is even more pronounced in the press release from Stockholm University, which quotes the main author commenting on 'the large influx of people from other parts of the world' to Viking Age Scandinavia (Stockholm University 2018). This sets the terms for the following communication, which almost exclusively focuses on questions of migration and ethnicity. Interviewed for a popular Swedish paper, one of the authors was quoted comparing Sigtuna to contemporary Shanghai, claiming that 'the Swede does not exist genetically' (Jansson 2018). This statement then began to circulate in anglophone online papers (Sputnik News 2018) and triggered politically invested reactions. Claiming that Swedes indeed exist genetically, the Allmogen blog used the researcher's statement as an excuse to fire a widespread attack on liberalism, postmodernism, Marxism and pro-immigration policies (Sjöberg 2018). From the wording of the original article to these final comments, the Sigtuna DNA analysis derived its meaning from a contemporary discourse of migration and ethnicity.

THE STORY BEGINS: INSERTING USEFUL NARRATIVE ELEMENTS

Both academic articles provided narrative elements which brought the Birka skeleton and the Sigtuna population into the realm of contemporary popular culture and politics. Both original articles contained aspects that signposted feminist and pro-immigration discourses respectively. In the Sigtuna case, the political potential of the results was significantly amplified by the additions (title and interview quotes) from the University's press release and were put into context by the upcoming national elections. In the case of the Birka warrior, the journal article itself contained several elements (the introductory reference to fierce female warriors, and the concluding poem) that catered to popular imagination and contemporary media discourse.

The Birka warrior made a significant public career, from extensive reports in news media and creative adaptations and interpretations on YouTube, to a porn site with direct reference to the academic article (*Warrior Woman Hardcore Sex*, n.d.). The Birka warrior even provoked a Twitter reaction from the White House administration (Donald Trump Jr liking a tweet by @Uncle_Jimbo 2017-09-11). Judging from headlines and imagery – where we see an overwhelming representation of pop-cultural images of attractive and aggressive ‘sheroes’, from Xena and Wonder Woman to *Game of Thrones* character Brienne of Tarth and Lagertha from the TV-series *Vikings* – the combination of enticing cultural imagery and the authority of genetics proved a particularly successful formula for gaining unprecedented attention to aDNA research.

If the story was spun by journalists, social media actors and visual media editors, the academic article was not ignorant vis-à-vis the potential for public attention. It can rather be seen as taking a more or less strategic orientation toward popular media discourse, with a framework and narrative elements designed to attract attention. In interviews and blog posts, the authors provided additional interpretations and suggested emotional significance. Moreover, on the project website the results were framed in a way that, contrary to the academic article's call for caution against sweeping interpretations (Hedenstierna-Jonson et al. 2017:858), quite boldly states that the research team ‘has uncovered a *fearsome* Viking warrior to be in fact a woman’ (ATLAS project, emphasis added).

These examples confirm that the media stories of the Birka warrior did not originate in downstream consumption, as a distortion of the scientific claims, but were already indicated in the academic paper and supported by additional interpretations provided by the authors. Of course, the researchers alone did not bring the image of fierce female Viking warriors into the public imagination. It existed already, not least in the representation of the shieldmaiden Lagertha in the History Channel's series *Vikings*, who is by

far the ‘shero’ most commonly associated with the Birka warrior in popular media. Interestingly, and further testifying to the entangled relationship between science and popularization in this case, one of the authors of the academic article has been regularly engaged as consultant expert for *Vikings* by the History Channel (e.g. SAU n.d.) and was also, along with the main author featured in a History Channel documentary, linked to the *Vikings* drama entitled *The Real Vikings* (2016).

University press officers also play key roles by translating and channeling research results with the aim of attaining maximum spread and public impact (Rödder 2009:459–460). In the case of the Sigtuna immigrants, the textual content of the press release played a crucial role in the communication of the research result. It had less impact in the case of the Birka warrior, but the press office was nonetheless involved in steering the communication in a distinct direction. For example, one of the press officers recalls that there was limited time to produce the media package with images for the press release. So when they noticed visual representations of female Vikings being shared on social media in connection with the story, they eagerly retweeted them: ‘Now we had nice pictures [...] everyone would spread this!’ (SU press officer, interview 2018-08-22).

THE END: INSERTING UNCERTAINTY

In a matter of days, both stories changed course due to detailed criticisms which were directed towards the interpretations in the academic articles. In the case of the Sigtuna article, the insertion of uncertainty regarding the viability of the scientific claims by the post at Allmogen effectively meant the end of its public career.

No responses to the two original articles were registered in academic journals within the three-month frame of our investigation (but see Price et al. 2019). However, especially in the case of the Birka warrior, scholars commented extensively in social and news media. According to Bucchi (1996) it can be seen as a ‘deviation’ from the routine routes of science communication when scientific debate takes place in public forums, something that may occur for example when scientific boundaries are in dispute (Goulden 2013:5, 8, 11). Here, however, the situation can probably be understood in relation to the current conditions for scientific communication and interdisciplinary knowledge exchange. The acceleration of mediatization in combination with the disciplinary divide between genetics, on the one hand, and history and archaeology on the other (Ion 2017), have likely pushed dissenting scholars to bypass the regular routes of scientific debate. The time-consuming process of peer-review does not correspond to the almost instantaneous nature of modern news cycles and social media debates. Moreover, the technical sections of the papers in *American Journal*

of *Physical Anthropology* and *Current Biology*, which describe the laboratory procedures and the population-genomics statistical methods, are inaccessible to most historians and archaeologists whose work the genetic research claims to augment (Goulden 2013; Egorova 2010). Also, most historians and archaeologists are active readers of news- and social media, and are thus often alerted to and have their expectations of new research results calibrated by news- and social media, before they read the academic article.

Jesch's (2017a) blogpost is in many ways emblematic of this situation. Jesch's dissent with the *American Journal of Physical Anthropology* article mainly concerned the ways in which the scientific results were interpreted and how textual evidence was treated. Hers is the point of view of a scholar of literature and language, and she was troubled by the lack of consideration of textual sources, enhanced by a scientific jargon through which topics that have been the concern of the humanities for centuries suddenly are supposed to be 'confirmed by genomics', 'without giving sufficient consideration of the "non-scientific" evidence which inevitably raised the questions in the first place' (Jesch 2017a).

While Jesch was critical of an academic discourse too focused on gaining attention and impact, suggesting that the article about the Birka warrior was 'designed for maximum worldwide public impact' (Jesch 2017b), one of the authors of the article dismissed Jesch's critique precisely on behalf of the non-academic character of the medium in which it was published. Interestingly, his suggestion that she ought to publish her critique in a peer-review journal was put forth in an interview with *The New York Times* (Anderson 2017, see also Götherström 2018).

This echoes what Murray Goulden (2013) has observed in relation to the 2004 discovery of *Homo floresiensis*. Although the original research team in that case used popular media extensively, they shunned criticism of their results by claiming that the critique had not been delivered in the approved format of peer-reviewed journals. Scientists, Goulden concludes, 'often criticise other scientists' popular activities, whilst acting similarly themselves' (Goulden 2013:580).

In January 2019, sixteen months after the first article, the authors of the Birka warrior article published a response to Jesch's criticism in the peer-reviewed journal *Antiquity* (Price et al. 2019). It was, just as the other articles, published open access but has so far (May 2019) not caused any significant response in news or social media. To publish research open access is a way to increase the speed from an article's acceptance to its publication. It also, of course, facilitates and invites a broader public discourse on research – a discourse which, in turn, is measured in terms of an article's public impact and visibility (like Altmetric's digital attention score). When science turns to, engages and measures the interest among the general pub-

lic, it can be expected that scientists' participation in public forum debates will eventually be prescriptive rather than viewed as a deviation from what previously may have been the routine routes of science communication.

Whether or not this is a desirable development for academic researchers is an open question. One of the authors of the article on the Birka warrior testified to the shock and exhaustion that followed the great success of the article, and the demands that came with it: months of unpaid full-time public service in the form of lectures, correspondence and interviews (ATLAS researcher, interview 2018-04-23). The researchers were unprepared for and unsupported in this, just as they were for the alternative forms of scholarly critique that were delivered through social media.

Conclusion

The media coverage of the Birka warrior and the Sigtuna immigrants demonstrates that they were intertwined in complex processes of communication involving a wide range of actors and media. In this article we have focused on mapping and analyzing the activities and relations between actors, institutions and media involved in these processes.

If the story of the Birka warrior grew wings in anglophone media owing to its connection with enticing fiction, feminist debate and strong imagery surrounding the Viking that has much traction in the anglophone world, the story of the Sigtuna immigrants was connected to a much more local debate relating to current Swedish politics. Hence there appears to be significant differences in science–media relations depending on language, cultural and political setting. Two main conclusions can be drawn from this observation. One is that different research results – even from the same project, the same discipline, and the same period of time – can create very different conversation patterns in the media. Another is that there ought to be reason for caution not to base global-scale arguments concerning science communication only on anglophone material. Our two cases demonstrate clearly that research results relating to Viking issues have quite different traction if we compare Scandinavian and anglophone media.

Although the media landscapes illustrated by our two network graphs contain traditional news media, news agencies and popular science magazines where journalists and visual media editors rework the research result to suit popular consumption, we also see considerable scholarly input: from the authors of the academic articles in several parts of the communication processes, and other scholars in interviews and public forum debates. Moreover, we see an intimate relationship with the contemporary discourse of feminism in the case of the Birka warrior, and an allusion to

current political debates on migration and ethnicity in the case of the Sig-tuna immigrants.

Already in the academic articles there are narrative elements and imaginary elaborations (such as ‘fierce female Vikings’ and ‘cosmopolitan group’) that served to attract media attention and sparked further interpretations in the public sphere. These were amplified by the University press office, and by interviews with the researchers, which were widely spread and reproduced. And credibility travels. So even though elaborations like ‘she’s most likely planned, led, and taken part in battles’ and ‘we find second-generation immigrants’ were obviously not deduced from any strings of DNA; they were leveraged by the strong sense of proof or evidence associated with genetics.

What we see in these two cases is essentially the combination of genetics as a hard ‘high-visibility science’ (Hilgartner 2012) with the malleable politically potent narratives of archaeology, and the spectacular pop-cultural imagery associated with the Viking. In the particularly successful case of the Birka skeleton it is evident that mixing Vikings with a feminist take on female warriors, and then adding DNA – metonymically referred to as proof or evidence – resulted in an explosive media cocktail of creative interpretations.

The relations between research and media are to some extent stipulated by the demands from university administrations (with communication offices and strategic guidelines for external relations) and grant agencies (calling for public outreach, open-access publishing and impact strategies). Great benefits are promised for researchers who are successful in the media, beyond the public visibility which many find attractive.

Now that archaeology has combined with genetics in aDNA research, there is reason to review more thoroughly aspects of media and communication. Archaeological narratives have retained their political potency and popular attraction, but the potential in terms of public impact has increased with leverage from media interest in DNA. This requires researchers to give the contemporary implications of aDNA both serious and critical attention.

Acknowledgements

The article is an outcome of the project Code, Narrative, History: Making Sense of Ancient DNA in Contemporary Culture, funded by Riksbankens Jubileumsfond, and was conceived at a productive writing retreat at The Bergman Estate. We acknowledge the use of the Altmetric programme and support of the team for the Altmetric Attention score metric. We are grateful to Charlotte Hedenstierna-Jonsson, Anna Kjellström, Andreas Gunnarsson, Per Larsson and Howard Williams for generous contributions to the research process, and the two anonymous peer reviewers for valuable comments.

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