1 RE-THEORIZING INTERDISCIPLINARITY, AND THE RELATION BETWEEN ARCHAEOLOGY, LINGUISTICS, AND GENETICS

KRISTIAN KRISTIANSEN AND GUUS KROONEN

1.1 Background: The Third Science Revolution

We are currently experiencing what could be called the "third science revolution" (Kristiansen 2014). The implications of this revolution are reshaping not only archaeological discourse, but – even more fundamentally – the nature and perception of interdisciplinarity (Stutz 2018). The current reconfiguration offers unique new opportunities for collaboration across the sciences and humanities, as we will show, but can also provoke a strong emotional response. This is apparent from the at times fierce debates about the role of science in archaeological, archaeogenetic, and perhaps especially archaeolinguistic interpretation (Gray, Atkinson, & Greenhill 2011 vs. Pereltsvaig & Lewis 2015; Ion 2017 and 2019; Ribeiro 2019; Sørensen 2016). We also see old debates about the role of historical linguistics in archaeology resurfacing (Hansen 2019). Common to all three revolutions – the Darwinian revolution, introducing the principles of stratification, deep time, and evolution to archaeology (1850–60); the environmental revolution and the C14 revolution, introducing absolute dating (1950–1960); and now the strontium/DNA revolution, introducing prehistoric population genomics and migrations (2010–2020) – is the transformation of previous relative knowledge to absolute knowledge.[1] In the process, each revolution freed intellectual resources to be spent on explaining change rather than describing and debating it. Thus, prior to the C14 revolution, most archaeological resources were poured into the classification and relative dating of prehistoric cultures. Beyond the safe dates of written sources, one had to project back in time the presumed length of time periods based on stratigraphy and typology. As we now know, all prehistoric periods earlier than the Bronze Age turned out to be much older than anticipated. Once the C14 revolution unfolded and thousands of dates established safe chronologies, intellectual resources could instead be spent on explaining change, leading to New Archaeology and what followed. Thus, these science revolutions were also intellectual revolutions, propelling archaeological theory and interpretation forward. However, these revolutions also exerted a deep impact on the other humanistic disciplines, especially linguistics. Historical linguistics was shaped during the same period of the mid nineteenth century, and while it developed its own methodology (Lehman 1992, chapter 2; Lehman 1993), it soon became apparent that timing the origin and expansion of the Indo-European languages demanded collaboration with archaeology, as well as environmental science, in order to establish secure dating. However, it was not until the second science revolution and the introduction of absolute dating that this collaboration could be based on safe chronological grounds. Unfortunately, this took place at a time when archaeology had lost interest in human migrations and diffusion, thus sidelining the question of the expansion of Indo-European languages – that is, until Colin Renfrew revitalized the debate with his controversial 1987 book *Archaeology and Language*.

However, the three science revolutions also expose a recurring dialectic between science-based and humanistic/historically based interpretations in archaeology, including historical linguistics. One might even call it a fight for interpretative dominance. Such debates are already unfolding during the third and present science revolution. It is reflected in a growing number of critical papers that, from various positions, opt for theoretical and interpretive renewal (Fuhrholt et al. 2018; Ion 2017; Ribeiro 2019), based in part on a critique of one-dimensional or deterministic interpretations (Arponen et al. 2020; Heyd 2017, response in Booth 2019; Kristiansen 2019), and problems with terminologies and their implicit implications for interpretation (Eisenman et al. 2019). We have already seen a number of responses from archaeogenetics that suggest a move toward a more holistic, systematic application of new interdisciplinary methods to integrate different

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[1] This does not imply that there is no possible debate about the interpretation or improvement of methodologies. A good historical example is the calibration curve of C14; similarly, one can also discuss how aDNA data are analysed and presented using different statistical methods. However, the baseline is that certain types of questions can be answered with a high degree of probability, and that genetic base data are correct, if correctly sequenced. Importantly, genetic data are stored and made accessible for further reanalysis and testing in global public databases. To match this, archaeological data still have some way to go.

3

TABLE 1.1. Timeline of the historical disciplines. The first science revolution resulted from broad interdisciplinary interaction. The second and third were restricted to archaeology and genetics, respectively, but with huge long-term effects on the other disciplines. The fourth revolution will require breakthroughs in the development of qualitative rather than quantitative models in the field of computational comparative linguistics.

	historical linguistics	prehistoric archaeology	evolutionary biology
1850–1900	tree model sound laws protolanguages linguistic palaeontology	principles of stratigraphy technological evolution principles of typology dating and classification of cultures	Darwinism Mendelian inheritance phylogenetics
1900–1950	structuralism *double articulation*	culture-historical synthesis	"modern synthesis"
1950–2000		C14 dating	discovery of DNA
2000–	computational linguistics	bioarchaeology	palaeogenomics

strands and levels of evidence, which will allow high-resolution local studies to inform wider patterns of change (Iversen & Kroonen 2017; Kristiansen et al. 2017; Mittnik et al. 2019; Racimo & Sikora et al. 2020; Sjögren et al. 2020; Veeramah 2018). This may also include mechanisms behind language dispersals and shifts that are linked to social processes. It can be demonstrated through ethnographic-linguistic-genetic case studies that language expansion through a sedentary population is channeled along those patrilocal or matrilocal groups who stay in residence, as is also reflected in genetic admixture patterns (Lansing 2017). We may perhaps be witnessing here the first contours of a new interdisciplinary discourse (Racimo & Woodbridge et al. 2020) yet to unfold. Likewise, we have seen a move toward a redefinition of the results and position of Indo-European studies in archaeology (Kristiansen & Larsson 2005: chapters 6–7), as well as the increasingly prominent role of historical linguistics in general in formulating and contextualizing the research questions of archaeogenetics (Damgaard et al. 2018).

As of yet, there appear to be no predetermined rules for how cultural and genetic phenomena interact, and it is clear that there is no one-to-one relationship between the two. Thus, the Beaker package was transmitted and adopted with little or no genetic admixture (Olalde et al. 2018), while Corded Ware represented a new cultural and economic adaptation of Yamnaya steppe ancestry, which, however, shared rules of kinship and burial rituals (Fuhrholt 2019). The social mechanisms behind the rise of new archaeological complexes, such as the Corded Ware, can be integrated into models for local language transmission among genetically admixed groups (Kristiansen et al. 2017). Multifaceted approaches involving aDNA and stable isotopes allow for the bioarchaeological reconstruction of local kinship systems and marital strategies, which additionally can be matched against their linguistically reconstructed equivalents (Mittnik et al. 2019; Sjögren et al. 2020). The new analytical techniques for the study of biomolecules thus promises not only to revolutionize the study of the human past by offering a new line of evidence, but also invites or perhaps even demands the unification of preexisting lines of evidence from archaeology, genetics, and linguistics into a single unified framework on human prehistory.

1.2   A Brief Research History

Historical linguistics and archaeology share a complicated and sometimes enigmatic interdisciplinarity relationship. In the

4

postwar period, it unfolded most clearly in Colin Renfrew's now-classic reinterpretation of the dispersal of the Indo-European languages in his 1987 book *Language and Archaeology*. It was a rather fierce critique of some of the methodological foundations of historical linguistics, specifically the subfield of linguistic palaeontology, and it aimed to offer a new interpretation of the origin of the Indo-European languages as being located in Neolithic Anatolia. A counterresponse was soon delivered by Mallory (1989), who defended the steppe hypothesis, and criticized Renfrew for devaluing linguistic methods to serve his own purpose of reinterpreting the puzzle of Indo-European origins. Others criticized Renfrew for misrepresenting later prehistory by dooming post-Neolithic societies to immobility (Anthony 1990; Kristiansen 1989). However, Renfrew's approach did garner strong support among an archaeological community that adhered to an autonomous antimigration discourse for later European prehistory, based in part on a response to the political misuse of prehistoric migrations and their proposed ethnicities during the prewar era (Demoule 2014). On the negative side, Renfrew and many other archaeologists besides confounded critique of the purely linguistic study of Indo-European languages with critique of the social and religious structure of their society, as represented by George Dumezil, who was central in developing this comparative field of research (Dumezil 1995). The field was expanded and critically reevaluated by later generations (Garcia 1999; Lincoln 1999), and has increasingly been integrated with archaeological interpretation (Kristiansen & Larsson 2005). On the positive side, Renfrew's book mobilized a lot of new research, and also invited new methodological developments, even if debatable from a linguistic point of view (Gray & Atkinson 2003; Gray, Atkinson, & Greenhill 2011, response in Pereltsvaig & Lewis 2015).

However, Renfrew also denounced the concept of culture in archaeology, which he wanted to replace with polities, governed by theoretically informed, testable generalizations (Renfrew 1977). It was Ian Hodder who reintroduced culture as meaningfully constituted, and thus demanding theoretically informed interpretations. Inspired by the work of David Clarke (1968), he accepted the historical reality of culture and its role in demarcating various forms of identities, past and present (Hodder 1978, 1982). It was Oscar Montelius who had formulated the principles of typology that allowed for the classification and definition of archaeological cultures, universally adopted in archaeology by the late nineteenth century (Montelius 1903). His methodology was clearly inspired by Darwinian principles and has much in common with linguistic principles of language change, but its principles do not aspire to becoming laws. Nonetheless, today it is widely accepted that archaeological cultures are objective phenomena characteristic of human societies since the Palaeolithic. It is also clear that cultures are layered and not necessarily homogenous, just as one can apply different degrees of resolution in classifying and defining culture groups, producing both regional cultures such as the Nordic Bronze Age Culture or the Tumulus Culture, as well as local variants in the way of spoken dialects. David Clarke summarized much of what still today remains the

theoretical and methodological basis of the "culture concept" in archaeology, amplified by quantitative methods, in his *Analytical Archaeology* (Clarke 1968). While the reality of culture cannot be questioned, its interpretation of course can be; this remains an underdeveloped field of research, due in part to oversimplified interpretations of the past. It therefore demands historical sensitivity to the way we employ cultural designations in archaeogenetic interpretation (Eisenman et al. 2018), but also to the way we designate linguistic and archaeological groups. However, the relation between culture, ethnicity, and language is clearly a potentially rewarding field of future research, when properly theorized (Hornborg 2014).

To linguists, the debates raging in archaeology can sometimes come across as otherworldly and bewilderingly overtheorized. Mobility is a ubiquitous factor in the expansion of languages in both the historic and modern periods, and the role it played in the shaping of the world's linguistic landscape is likewise assumed to have been fundamental (cf. recently Crevels & Muysken 2020). Thus, the antimigrationism that came to dominate mainstream archaeology in the latter half of the twentieth century implied an almost unimaginable violation of the uniformitarian principle and was never able to gain a foothold in historical linguistics. Archaeologists of the past decades have been correct to reject simplistic and essentialistic models that invoke large-scale mobility of ethnolinguistic monoliths as the default explanation of cultural and linguistic change (Adams, Von Gerven, & Levy 1978), and even today, historical linguists remain underinformed on average about the risks of overinterpreting archaeological evidence. By now it seems clear, however, that in the antimigrationist paradigm, human mobility was overproblematized to the extent that it acquired the characteristics of a taboo (Anthony 1990). While taboos are beneficial in that they may help us save energy on debating demonstrable misinterpretations, such as Holocaust denialism, the archaeological "ban on migration" appeared to be theoretically rather than empirically motivated. Moreover, it isolated archaeology from the other historical disciplines, and effectively put an embargo on interdisciplinary dialogue with linguistics, and initially also with palaeogenetics.

The same dialogue was further obstructed by yet another misunderstanding that appears to have been common among archaeologists, i.e., the assumption that the Indo-European language family is merely a "narrative" that can be replaced – almost interchangeably – with any other narrative, depending on which theoretical, political, or ideological perspective happens to be in vogue. From this "archaeocentric" interpretation of the linguistic data, it is perfectly understandable how some archaeologists appear to experience discomfort or even anxiety when confronted with the field of Indo-European studies, as it seems unclear why one would uphold what looks like an essentialistic, nineteenth-century interpretation of language and people (cf. most recently Hakenbeck 2019; Hansen 2019). The fact is that the Indo-European linguistic phylum is not an interpretative narrative that can be repurposed at will to suit any new ideological framework; rather, it is a mere taxonomic unit, directly inferred – by a universally accepted method – from the world's linguistic record, just like all other language families

that have similarly been identified. Any answer to the puzzle of Indo-European origins will have to start from this basic, unalterable linguistic fact.

Over the past decades, several archaeologists have nevertheless attempted to come up with alternative narratives of the Indo-European origins. To linguists, many of these narratives appear "fact-free," or at least free of linguistic facts. Here we may recall the Anatolian Hypothesis, which was only able to thrive in non-linguistic research environments, as it questioned the culturally and temporally salient features, as they are captured in the reconstructed Proto-Indo-European lexicon, that are indicative of a Late Neolithic language community. We could also add more fanciful narratives. According to the Palaeolithic Continuity Theory (Alinei 1996, 2000; Ebbesen 2009; Otte 1999), Indo-European would have been spoken in Europe since the arrival of *Homo sapiens sapiens*, with no linguistic incursions having taken place ever since. Of late, a narrative has been created that calls the reality of the Indo-European language family itself into question (Demoule 2014). Such "post-factual" narratives from archaeology can be perplexing to the unsuspecting linguist, but what they seem to have in common is a shared aspiration to offer workarounds to the aforementioned archaeological taboo, i.e., the necessity of having to postulate prehistoric population movements.

The issue with such perspectives is, of course, that in the case of the Indo-European dispersal a Late Neolithic population movement is exactly what the linguistic data suggests, and has been shown to suggest since the late nineteenth century. The picture emerging from the breakthrough genetic studies of 2015 was that the detection of the massive gene flow from the Russian steppe to the Corded Ware complex (Allentoft et al. 2015; Haak et al. 2015; Malmström et al. 2020) ended a primarily archaeological controversy, i.e., the one between the Kurgan Hypothesis and the Anatolian Hypothesis. However, the idea that the Indo-European languages spread from the South Russian steppes does not itself hail from archaeology and was first developed in historical linguistics. Even before the discovery of Hittite and Tocharian and the decipherment of Linear B, the German Indo-Europeanist Otto Schrader (1883) was able to conclude as much on the basis of his cultural and environmental analysis of the reconstructed Proto-Indo-European lexicon.

Thus, the field of Indo-European linguistics was well prepared for the results of genetics, when they finally provided the proof that steppe migrations had fundamentally impacted the genetic composition of Europeans (Allentoft et al.; Haak et al. 2015; Olalde et al. 2018). It revealed the demographic vector that had been postulated on the basis of lexical evidence more than a century earlier and it was defended by linguistically informed archaeologists such as J. P. Mallory and D. W. Anthony. Perhaps more crucially, the revolutionary findings from genetics also offered an opportunity to overcome a decade-long stalemate on prehistoric mobility that had paralyzed the interdisciplinary dialogue between archaeology and linguistics.

The third science revolution has been unfolding since 2010, but its beginnings were much earlier. Ammerman & Cavalli-Sforza (1984) were among the first to take advantage of the initial genetic breakthrough of mitochondrial DNA in the early 1980s in an attempt to use modern genetic data to infer prehistoric migrations (discussed in Reich 2018: Introduction). Soon it became possible to extract mitochondrial DNA from ancient samples, which however, contains only a fraction of genetic evidence, linked to the female lineage. The first wave of optimism was soon replaced by pessimism, as it turned out that contamination from present-day human DNA was a nearly insolvable problem. It was only after the publication of the first full human genome in 2004 and the development of short-read sequencing technologies that ancient DNA genome research became a reality, with the first prehistoric genomes published by the Copenhagen team (Rasmussen et al. 2010) and the Max Planck team (Green et al. 2010) in 2010. Since then, we have seen a steep increase in new data, as well as new results that have changed the perception of prehistory globally (as summarized in popular books by Reich 2018 and Krause 2019). This has been followed by the extensive popular dissemination of results, sometimes in more sensational form than desired. On the other hand, this is nothing new for archaeology; the same happens when new excavations produce "sensational" results. Genetic results, however, are potentially more prone to ideological misuse. Often, new results will be published globally in more than one hundred news outlets within a week after publication, as happened with a paper on the earliest plague in the world (Rascovan et al. 2018). This demands an acute and critical understanding of the role of popular dissemination and its possible ideological use, for good and bad – a new field of research to be developed (for example in Källen et al. 2019).

In addition, modern DNA research raises fundamental questions about what it means to be human (Barrett 2014), what genetic variation means, what archaeological cultures mean (Roberts & Vander Linden 2011), and the prospects of such knowledge for ideological propaganda, whether racist/antiracist, nationalist or antinationalist (Frieman & Hofman 2018; Hakenbeck 2019). In short, it demands a stronger public engagement by archaeologists, scientists, and humanists, perhaps to a degree we are not used to. While archaeology has a long and sometimes glorious history of popularization, there is less experience in taking part in critical public debates, whether in newspapers, television, or on the web. Understanding the political and ideological impact of the past in the present is often best understood in critical retrospect (Diaz-Andreu & Champion 1996), which, however, may also serve as a warning in the present. Critical heritage studies present a new discourse to cope with these complex questions (Harrison 2013). Based on these observations, we shall discuss the impact and critical role of ideological misrepresentation.

1.3   The Danger of Ideological Misrepresentation

Many scholars researching the human past fear that the current revolution in the study of ancient DNA will again invite

simplistic, racist equations of culture, people, and language as in the past. In the prewar period, the prehistoric spread of the Indo-European languages was increasingly attributed to the superiority of an alleged Indo-European-speaking ethnolinguistic unity, which, despite all linguistic evidence to the contrary, was claimed to have developed, since the Neolithic, in North Europe. Through the *Siedlungsarchäologie* of Gustaf Kossinna (1858–1931), the question of Indo-European linguistic origins was integrated into nationalist theories of German ethnic origins, which demanded a North European center of spread. But similar ethnic interpretations were widespread in both archaeology and ethnography. In his book *The Aryans* (1926), British archaeologist Gordon Childe proved himself reluctant to fully accept Schrader's South Russian homeland – because of a lack of archaeological data from that area, as he objects, but also, perhaps, because he had become convinced that the superiority of Indo-European-speaking groups ensued from "a more excellent language and the mentality it created." It is very well possible that future interdisciplinary studies will again lead to misinterpretations that are liable to political abuse. Here we should mention the rise of an "Out of India" model of Indo-European languages during the last generation, motivated primarily by Hindu nationalism. These are the same kind of forces that used the model of Gustaf Kossinna to support a Nazi racist ideology nearly one hundred years earlier. However, the Out of India model has been firmly refuted by recent aDNA results (Narasimhan et al. 2019), and it has little or no support in historical linguistic research (cf. Witzel 2012). However, it should serve as a warning example of the political impact of nationalism, even in the present (cf. also Schnirelman 2001).

The most obvious risks of ideological misrepresentation occur when such forces infiltrate the academic environment, as happened in Germany during the Nazi regime. But the risk of such abuse will likely only increase if relevant evidence is ignored rather than welcomed. If there is anything that the recent interdisciplinary biomolecular studies have shown, it must be that the once-dominant Eurocentric and supremacist perspectives on the Indo-European homeland are not supported by any genetic or linguistic evidence.

However, we must be aware of the huge popular interest in the new genetic results, and the need to constantly and critically debate their dissemination, also in the public domain (Kristiansen 2014: 25), where complex knowledge can sometimes be transformed into dangerous stereotypes (Frieman & Hoffman 2019; Heyd 2017). The past has always been exploited for political purposes, for good and bad (Diaz-Andreu 2007). One of the most destructive political misuses of the past has been in constructing nationalist narratives of exclusion (Kohl & Fawcett 1995). According to aDNA, all Europeans have been subject to the same genetic admixture processes, and thus there is no genetic support for such narratives. On the contrary, all Europeans belong to the same genetic stock or "family," a message that has been communicated in popular books by geneticists, science journalists, and others (Bojs 2017; Krause 2019; Reich 2018).

While some current researchers are concerned with the darker side of potential misuse (Hakenbeck 2019; Ion 2019),

this should not lead us to introduce politically motivated restrictions on research and on academic freedom. Rather, we need to engage in the ways new results are disseminated (Källen et al. 2019), whether in writing popular books or articles or engaging with science journalists, whose articles reach a wide readership.

1.4 From Here On: Toward a New Interdisciplinarity?

Which theoretical developments and new forms of interdisciplinarity can we then expect of the future? First, we need to pay attention to the methodological and interpretative autonomy of the different research disciplines, whether in the sciences or the humanities – both when we criticize interpretations, and when we attempt to integrate interpretations. What are their commonalities and differences? How do we integrate different types of evidence from different disciplines – science, historical linguistics, and archaeology – into a unified interpretation respecting all three fields? In the words of Tim Flohr Sørensen, "we need to consider the potential that a question, an observation, an object, a fact, are not synonymous concepts in science and in the humanities. Why else would we apply different methods and theoretical perspectives?" (Sørensen 2017). While this may be correct, at least in part, the problems of interdisciplinary interpretation are of a more complex nature. No method can have priority over another method, as methods are inherent to a specific scientific tradition and cannot be questioned from the outside. But if Sørensen is correct, then neither can any interpretation of a specific set of data have priority over an interpretation of another set of data if they are confined within different discourses. Consequently, historical-archaeological interpretations are not inherently more correct than genetic or linguistic interpretations. In addition, there exists no genuine archaeological theory of human societies; what is inherently archaeological, besides excavation, is the repertoire of methods to describe changes in material culture. However, interpretation of that evidence can only be carried out by comparison between the known and unknown, that is through comparative analysis with ethnographically and historically documented societies. Archaeological theory is therefore based on shared, comparative theoretical models of human societies anchored in social and historical research traditions. So-called "middle-range theory" is an attempt to bridge the two – archaeological data and theory – in order to create a more robust middle ground, but it does not add up to a complete social theory (recent discussion in Arponen et al. 2018).

Likewise, with historical linguistics: this discipline shares certain basic methodological strategies, based on typology and regularities in language change, with archaeology and genetics. The spontaneous sound changes that occur randomly in languages are passed down the linguistic tree much in the same way that mutations accumulate in uniparental parts of the human genome (Comrie 2003). Famously, the taxonomic tree model itself was first developed and applied to languages by the

7

linguist August Schleicher in 1861, after having read Darwin's *On the Origins of Species* and subsequently introduced to biology by Ernst Haeckel in 1866 (Aronoff 2017). However, unlike the random mutations of genomes, the sound changes by which languages evolve and diverge from each other can only be ordered, with the available linguistic methodology, in relative chronologies. For the absolute dating of protolanguages and their corresponding speech communities, historical linguistics depends on collaboration and comparative evidence from the other disciplines, most prominently archaeology: it is only through the linguistically reconstructed lexicon that prehistoric speech communities, i.e. linguistically defined population groups, can be approximated in space and time (cf. Mallory 2021). In the same way, aDNA results require archaeological evidence to be properly dated and contextualized, while their genetic interpretation depends on knowledge internal to the discipline. Their implications for archaeology, therefore, demands familiarity with the methodological and interpretative field of genetics, and vice versa (Booth 2019).

While historical linguistics, archaeology, and genetics have developed their own methodological repertoire – some shared, some not – both linguistics and genetics depend on archaeological historical dating and the correct interpretation of their contexts. Likewise, archaeology depends on linguistics and genetics for the correct interpretation of admixture processes and their implications for population genomics. With respect to linguistics, reconstructed protolanguages provide clues to the environmental context and stage of development of prehistoric groups – in the case of the Indo-European speech community, fundamental terminologies linked to technology (wagon and wheels, metals) social organization (kinship terminologies), and religion (names and functions of gods and rituals). Each of these knowledge domains is governed by analytical rules of proof and falsification internal to each discipline, but with implications for the other disciplines. Dating and correct historical interpretation depend on a proper source-critical understanding of the context of the archaeological source, and application of genetic and linguistic evidence in archaeological interpretation depends on a proper source-critical understanding of the genetic and linguistic contexts of the evidence. Otherwise, we may end up with circular reasoning based on flawed interpretations of the other disciplines. This imposes a demand for familiarity with the limits of interpretation internal to each discipline for interdisciplinary interpretations to be correct, or at least scientifically viable.

Thus, archaeology, historical linguistics, and genetics share the methodological demands of analytical systematics, statistical significance, and testable procedures in their basic repertoire. However, that does not produce a final interpretation; this demands a wider context, including comparative knowledge of results from other disciplines. And this inevitably reduces the number of researchers who are capable and willing to provide that extra investment of labor in a new field where such interpretations will remain debatable for the foreseeable future. Until now, the most productive way forward has been project teamwork where archaeologists, geneticists, and researchers from other relevant disciplines, such as environmental science,

historical linguistics, and others, work together, from formulating research goals to final publication.

In the end, therefore, the real challenge is, how do we balance evidence from different disciplines in interpretation? As there is yet no methodological approach able to combine and statistically evaluate results from, say, environmental analysis, genetics, and archaeology, the task is a difficult one. One may be able to document statistical correlations between such different types of evidence, as has recently been done (Racimo & Woodbridge et al. 2020), but there is a giant step from correlation to explanation/interpretation. In the future, we may well see complex modeling that is able to handle the task of weighting qualitatively different types of data as to their relative impact in a historical process of change, but we are not yet there. It all comes down to the complexity of evidence that is anchored in different theoretical and methodological traditions, each of whose results have an impact on the interpretation of other types of data. In the end, the final interpretation will have to be presented in the form of an interpretative narrative, where documentation is either found in a supplementary, as is most common in science journals, or simply based on previous research (Kristiansen et al. 2017; Mittnik et al. 2019). Therefore, we need to develop the concept of interpretative narratives, which have long been debated in the discipline of history (White 1987). Perhaps it suffices, for the moment, to define them as platforms for the formulation of testable new hypotheses. We may then perceive scientific practice as a layered process, proceeding – through processes of proof and falsification – from basic information toward increasingly wider-ranging interpretations, ending in an interpretative narrative. This is irrespective of whether we are talking about large geographical regions or narrow, contextualized studies of single communities. The process remains the same, and the results should in the end be compatible. If not, a new interpretation is needed, and the process starts all over again.

This book is an attempt to establish such a new practice, where each discipline contributes knowledge to a common theme based on its own scientific premises, yet contributing to produce a new, integrated historical narrative. We hope it will inspire others to come up with new interpretations, whether critical or supporting. Being proven wrong is the first step toward getting it right. In that sense, Colin Renfrew's contribution to integrating language and archaeology in new ways, though since proven wrong, has been fundamental, since he propelled the research forward with new speed and intensity. From a theoretical point of view, his interpretative models rejuvenated the interdisciplinary field by providing a strong interpretative narrative. We are now starting the process anew.

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