

# Culture Contacts in Ancient Worlds: A Review of Theoretical Debates and Practical Applications

## Introduction

Already since the 1970s, there has been considerable interest in the phenomenon of globalization and long-distance contacts in all branches of the social sciences and humanities. In the field of history in particular, the interconnectedness of events and developments occurring in different parts of the world has long been appreciated, however, it is often assumed that globalization is a relatively recent phenomenon. Although long- and short-distance interactions around the globe have increased and intensified considerably over the last decades, archaeological research has made it clear that pre-modern communities were by no means isolated. Indeed, various types of interactions – direct and indirect, over longer and shorter distances, and even over time through heirlooms and antiquarian interests – have connected people around the globe from earliest prehistoric times. Archaeology provides one of the richest, most long-term records of such interactions and their development over time, a resource that can help extend *longue durée* studies of historical and societal developments beyond what written evidence can elucidate. Unfortunately, this great potential of archaeological material is often overlooked in other disciplines. The present paper thus provides an overview of previous as well as recent trends in archaeological research on culture contact, emphasizing the potential of multi-disciplinary work and the various types of insights and information that material evidence – both cultural and natural – and archaeological studies can add to discussions in other fields, in particular history.

An early and very successful attempt at multi-voiced discussions on culture contact was undertaken in 1995 at the Southern Illinois University with a conference entitled *Studies in Culture Contact: Interaction, Culture Change, and Archaeology*, many of whose contributions combined material and textual evidence and a variety of theoretical models.<sup>1</sup> In the resulting edited volume, the papers were framed by an introduction by James G. Cusick reflecting on previous discussions on culture contact, and an afterword by Rani T. Alexander evaluating the potential for archaeology to develop a unified archaeological theory of human contact. Since then, interest in culture contact, especially long-distance movement of people, things, and “ideas” has increased significantly, with new sources of evidence, approaches, and concepts emerging and old ones continuing to be used, resurrected, or fading into the background. It is thus time for a reassessment of the state of the field, a reassessment that is hoped to provide an initial overview and guide especially for historians and scholars from other fields in the humanities and social sciences who are interested in these concepts and may be enticed to consider archaeological materials, examples, and approaches.

Like the introduction by Cusick, the present paper emerged from a conference entitled *Cultural Contacts in Ancient Worlds: Theories and Case Studies* held in Oxford in 2017. This conference, organized in collaboration between the Universities of Oxford and Munich, brought together researchers from various fields in the humanities and social sciences. The presentations covered a wide range of approaches such as network analysis, isotope studies, genetics, material analysis,

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<sup>1</sup> Cusick, James G., ed. *Studies in Culture Contact: Interaction, Culture Change, and Archaeology*. Carbondale: Center for Archaeological Investigations, Southern Illinois University, 1998.

linguistics, stylistic comparison, and iconography, applied to material ranging from East Asia to the Americas and from the late Paleolithic to the 16<sup>th</sup> century. It thus featured some new approaches not yet developed in the 1990s. Furthermore, the Carbondale conference had a strong Anglo-American focus. By contrast, the participants of the Oxford conference came from a wider range of backgrounds and presented on material from various parts of Europe, Asia, and the Americas. Inspired by the lively discussions at the conference, the present paper provides an overview of previous discussions on culture contact within the field of archaeology, then turns to recent trends, and finally discusses current and potential future avenues of research. By introducing this research to an audience of scholars working on various aspects of history around the globe, this paper wants to push the interdisciplinary dialogue by showing the potential of archaeological case studies for general discussions on culture contact and related topics, and to reflect on the current state and future avenues of research in a widely accessible way.

## Concepts of Culture and Contact in Archaeological Research

Patterns in material remains, in particular variability in object appearance and distribution over time and space, and the relation of both to past human behavior are central topics of archaeological enquiry. The explanations for such patterning often revolve around “cultures” and various types of “contact” or “influence”, all of them highly contested concepts. In discussions on contact situations, only a micro perspective allows avoiding the problematic culture concept altogether. Here, archaeologists tend to talk about “groups” or “communities”. On the smallest scale, such groups can be defined based on shared place of residence or less clearly demarcated social groups within single settlements. Once larger entities are discussed, “communities of practice” are a relatively widely accepted concept as they are defined based on shared behavioral patterns that have material correlates.<sup>2</sup> When more than one settlement community is in focus, however, and medium-scale stories are to be told, the concept of archaeological cultures “seem to have found a second life in the search for numerous local or regional groups.”<sup>3</sup> In macro-level discussions, archaeological cultures reappear, seemingly inevitably so. As has become clear from Roberts’ and Vander Linden’s 2011 edited volume on *Investigating Material Cultures*, so far no alternative conceptual framework has been suggested, and thus “archaeological cultures still form the basic blocks from which to create larger syntheses.”<sup>4</sup> This does not have to be a problem as long as the term “culture” is used explicitly in the sense of archaeological cultures, artificial units created as tools of

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<sup>2</sup> The focus is most often specific technological traditions, see for instance Wendrich, Willeke. *Archaeology and Apprenticeship: Body Knowledge, Identity, and Communities of Practice*. Tucson: University of Arizona Press, 2012. For a general discussion of the concept beyond archaeology, consult Cox, Andrew. "What Are Communities of Practice? A Comparative Review of Four Seminal Works." *Journal of Information Science* 31, no. 6 (2005): 527-40. More rarely, burial practices are also viewed from this angle, see for instance Hein, Anke. *The Burial Record of Prehistoric Liangshan in Southwest China: Graves as Composite Objects*. Cham, Switzerland: Springer, 2017.

<sup>3</sup> Damm, Charlotte. "From Entities to Interaction: Replacing Pots and People with Networks of Transmission." In *A Linguistic Map of Prehistoric Northern Europe*, edited by Rihó Grünthal and Petri Kallio, 41-62. Helsinki: Société Finno-Ougrienne, 2012: 45-46.

<sup>4</sup> Roberts, Benjamin W., and Marc Vander Linden. "Chapter 1: Investigating Archaeological Cultures: Material Culture, Variability, and Transmission." In *Investigating Archaeological Cultures: Material Culture, Variability, and Transmission*, edited by Benjamin W. Roberts and Marc Vander Linden, 1-21. New York: Springer, 2011: 4.

archaeological research and not equivalent to linguistic or ethnic groups identifiable through historical texts or DNA research.

Contact between different places and communities may or may not lead to shifts in behavioral patterns and object assemblages that can be observed archaeologically. Within the culture-historical school of thought, it had been assumed that innovation was rare, prehistoric cultures were thought to be static, and change was supposed to come about through culture contact and diffusion of ideas from a few centers of innovation.<sup>5</sup> This idea was proposed in opposition to cultural evolutionism which assumed that similar environments lead to similar cultural developments. Within the new, diffusionist thinking of the early 20<sup>th</sup> century, cultures were seen as discrete units, with the migration and diffusion of a few original cultures leading to culture contact, influence, and change.<sup>6</sup> Given the colonialist perspective and racist undertones of the discussion, cultural diffusionism rightfully received much criticism and fell out of favor in the second half of the 20<sup>th</sup> century.

At that time, the idea of human actions being determined by human nature and environmental constraints were picked up again by the New Archaeology movement, albeit in modified form. Arguing within a system-centered framework, proponents of this movement assumed that culture change emerged from within or was caused by environmental change.<sup>7</sup> The focus was on process within small communities, and cultural particularism was emphasized, leaving no room for culture contact, supra-local developments, or materiality.

Despite being established in direct opposition to the Processualist movement, Post-Processualism likewise focused on small-scale case studies and local communities, emphasizing individual actions and agency, which may be observed in small-scale studies, but are more difficult to consider within large-scale approaches. Within this new, rather broad school of thought, change was seen as emerging from individuals deciding to bend the rules of society,<sup>8</sup> or – in the Marxist tradition – as emanating from class conflict or similar internal changes.<sup>9</sup> Identity building and negotiation became a central concern, while at the same time materiality came into focus again, albeit not as direct reflection of firmly-bound archaeological cultures, but rather as both object and subject in inter- and small-scale intra-community negotiations.<sup>10</sup>

Both schools of thought agreed in their criticism of contact and influence as blanket explanations of culture change which they rightly criticized as simplistic and even detrimental to the

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<sup>5</sup> The earliest proponents of this concept of diffusionism were Leo Frobenius (*Der westafrikanische Kulturkreis*. Petermanns Mitteilungen. Vol. 43/44, Gotha: J. Perthes, 1897/98) and Friedrich Ratzel (*Anthropogeographie 1: Grundzüge der Anwendung der Erdkunde auf die Geschichte*. Stuttgart: Engelhorn, 1899; *Anthropogeographie 2: Die Geographische Verbreitung des Menschen*. Stuttgart: Engelhorn, 1912).

<sup>6</sup> Frobenius, *Der westafrikanische Kulturkreis*.

<sup>7</sup> For a statement of the principles of Processualism, see for instance Binford, Sally R., and Lewis R. Binford. *New Perspectives in Archeology*. Chicago: Aldine Publishing Company, 1968, and for a critical reflection consult Trigger, Bruce G. *A History of Archaeological Thought*. Cambridge: Cambridge University Press, 2006, pp. 314-385.

<sup>8</sup> The underlying anthropological theories have been developed by Giddens, Anthony. *The Constitution of Society: Outline of the Theory of Structuration*. Berkeley: University of California Press, 1984.

<sup>9</sup> Discussed and critized e.g. by Sahlins, Marshall. *Culture and Practical Reason*. Chicago: University of Chicago Press, 1976.

<sup>10</sup> For a classic example consult Hodder, Ian. *Symbols in Action: Ethnoarchaeological Studies of Material Culture*. Cambridge: Cambridge University Press, 1982.

understanding of the complex interplay of factors leading to transformations in human behaviors and their material correlates. Nevertheless, as Boas pointed out, people and communities have always been in contact, leading to an exchange of material goods as well as more abstract things such as technologies or even religious beliefs.<sup>11</sup> Or, as Gosden put it, “Culture contact is a basic human fact”,<sup>12</sup> making it impossible to ignore even in small-scale studies of local developments. The issue remains, however, that the term culture contact “presupposes that there are indeed different cultures interacting”.<sup>13</sup> Concepts of culture and contact are thus both essential to archaeological research and inextricably linked, but also problematic and need to be discussed and defined in all studies on inter-community interaction.

## Colonialization, Acculturation, and World-Systems Theory

For many decades, theoretical discussions on culture contact have concentrated on colonial situations with a focus on the Americas. Within this tradition, many papers claiming to address cultural contact in general end up talking only about colonialist encounters.<sup>14</sup> Such debates are often dominated by the point of view of white and usually male colonizers seen through the lens of textual accounts they left behind. This focus on uneven power relations and the colonizers’ view is not limited to the Americas, however, but also occurs in research on the Mediterranean world and other parts of Europe under the Roman Empire or during the flourishing of the Greek world.<sup>15</sup> Within frameworks of acculturation theory commonly applied in such studies, it is assumed that the less powerful society undergoes considerable change while the powerful may not. Acculturation is seen as a passive and directional process with an inevitable adoption of western values and lifeways.<sup>16</sup> Another, much criticized assumption is that pre-colonialism “people had blindly followed cultural prescriptions and norms” and that their customs had remained largely unchanged over long periods of time.<sup>17</sup> Although it does now seem obvious that these assumptions are unwarranted, as recent as in the mid-1990s it still was an important new insight to point out that “Native American societies were undergoing cultural transformations before their first face-to-face contact with Europeans.”<sup>18</sup>

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<sup>11</sup> Boas, Franz. *Race, Language and Culture*. New York: The Macmillian Co., 1940, p. 220.

<sup>12</sup> Gosden, Chris. *Archaeology and Colonialism: Cultural Contact from 5000 B.C. To the Present*. Cambridge, UK; New York: Cambridge University Press, 2004, p. 5.

<sup>13</sup> Baltali, Sevil. "Culture Contact, Cultural Integration and Difference: Mesopotamia." *Stanford Journal of Archaeology* 5 (2007): 1-17, p. 7.

<sup>14</sup> e.g., Silliman, Stephen W. "Agency, Practical Politics and the Archaeology of Culture Contact." *Journal of Social Archaeology* 1, no. 2 (2001): 190-209. This trend has been criticized for example by Shortman, Edward M., and Patricia A. Urban. "Culture Contact Structure and Process." In *Studies in Culture Contact: Interaction, Culture Change, and Archaeology*, edited by James G. Cusick, 102-25. Carbondale: Southern Illinois University Press, 1998, p. 104.

<sup>15</sup> Consult Dietler, Michael. "Consumption, Agency, and Cultural Entanglement: Theoretical Implications of a Mediterranean Colonial Encounter." In *Studies in Culture Contact: Interaction, Culture Change, and Archaeology*, edited by James G. Cusick, 288-315. Carbondale: Southern Illinois University Press, 1995 for a critical view.

<sup>16</sup> e.g., Barnett, Homer Garner. "Culture Processes." *American Anthropologist* 42 (1940): 21-48, esp. p. 22.

<sup>17</sup> Silliman, Stephen W. "Agency, Practical Politics and the Archaeology of Culture Contact." *Journal of Social Archaeology* 1, no. 2 (2001): 190-209.

<sup>18</sup> *ibid.*, p. 200.

In spite of this continued focus on colonial situations and the post-contact Americas as the prime laboratory for the development of theories and models of culture contact, acculturation theory has by now given way to more nuanced views of the colonized as active agents and interaction in colonial contexts as negotiations, discussing active resistance, strategic adoption, and creative solutions for arising conflicts.<sup>19</sup> In this context, Scott's passive resistance model and the idea of a *zomia*, marginal and/or inaccessible highlands that are outside of the control of nation states and serve as areas of retreat from governmental authorities, have gained popularity especially during the early 2000s.<sup>20</sup> Nevertheless, the latter concept, rather than standing in opposition to the much criticized center-periphery models within World-Systems Theory, fits within concepts of dominant and "submissive" societies and their encounter.

Wallerstein's World-Systems framework, developed from the 1970s in opposition to modernization theory, sees the emergence of the capitalist world economy as a long-term process that cannot be understood from the perspective of the nation state but rather has to be conceptualized as a set of mechanisms of redistribution and dependency between dominant cores and dependent peripheries.<sup>21</sup> Most influential in archaeology was Friedman's and Rowlands' model of cores exploiting peripheries through prestige-goods exchange, a model applied in particular to Uruk-period Mesopotamia, but also to the Iron Age European Hallstatt complex, the Mediterranean, and pre-contact Mesoamerica.<sup>22</sup> In all of these contexts, it has been emphasized that local developments cannot be understood based on local particularities or small-scale inter-group or intra-group interactions alone, but that larger-scale developments and long-distance connections have to be taken into account.

This model, but even more so its application in archaeology has been criticized for operating within a simplistic model of dominant, active cores vs passive, powerless peripheries, with no attention being paid to individual agency and small-group dynamics.<sup>23</sup> The focus on economic motives as main *movens* coupled with a disregard of cultural factors has likewise been criticized.<sup>24</sup> Other drawbacks that this approach shares with acculturation theory are the emphasis on inequality and

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<sup>19</sup> See for instance Voss, Barbara L. *The Archaeology of Ethnogenesis: Race and Sexuality in Colonial San Francisco*. Berkeley: University of California Press, 2008.

<sup>20</sup> Scott, James C. *Domination and the Arts of Resistance: Hidden Transcripts*. New Haven: Yale University Press, 1990; Scott, James C. *The Art of Not Being Governed: An Anarchist History of Upland Southeast Asia*. New Haven: Yale University Press, 2009.

<sup>21</sup> Wallerstein, Immanuel Maurice. *World-Systems Analysis: An Introduction*. Durham: Duke University Press, 2004.

<sup>22</sup> For the theoretical-methodological background consult Friedman, Jonathan, and Michael Rowlands, eds. *The Evolution of Social Systems: Proceedings of a Meeting of the Research Seminar in Archaeology and Related Subjects, Held at the Institute of Archaeology, London University*. Pittsburgh: University of Pittsburgh Press, 1978. For case studies, consult Algaze, Guillermo. *The Uruk World System: The Dynamics of Expansion of Early Mesopotamian Civilization*. Chicago: University of Chicago Press, 2005; Frankenstein, Susan, and Michael J. Rowlands. "The Internal Structure and Regional Context of Early Iron Age Society in South-West Germany." *Bulletin of the Institute of Archaeology* 15 (1978): 73-112; Peregrine, Peter N., Gary M. Feinman, and Christopher K. Chase-Dunn. *Pre-Columbian World Systems*. Madison, Wis.: Prehistory Press, 1996.

<sup>23</sup> Shortman, Edward M., and Patricia A. Urban. "Culture Contact Structure and Process." In *Studies in Culture Contact: Interaction, Culture Change, and Archaeology*, edited by James G. Cusick, 102-25. Carbondale: Southern Illinois University Press, 1998, p. 106-7.

<sup>24</sup> Robertson, Roland. *Globalization: Social Theory and Global Culture*. London: Sage, 1992.

power, the preoccupation with actions in the cores from the perspective of the elite, and the focus on the large-scale.

## Globalization, Glocalization, and Agency

The term Globalization in the economic sense has been used at least since the 1980s, in the first instance applied exclusively to the modern world. It now is used more widely to refer to the emergence of long-distance networks between companies, governmental institutions, but also smaller communities and individuals acting within systems of economic and cultural exchange.<sup>25</sup> In opposition to previous approaches, Appadurai argued that the “new global cultural economy has to be understood a complex, overlapping, disjunctive order which cannot any longer be understood in terms of existing center-periphery models”.<sup>26</sup> Especially in archaeology, the adoption of this approach is partially a reaction to the awareness that there are no “pure”, discrete cultural units with firm boundaries connected within systematically organized regional interaction spheres or hierarchical world systems,<sup>27</sup> but that there are no clear demarcations and that not only goods but also technologies, norms, and other concepts can circulate widely. Globalization furthermore goes against the central assumption of world systems theories that processes of exchange are merely economically driven and dominated by one or several cores. What emerges is a concept of a much less orderly but more widely interconnected world.

In contrast to the long-held view that past and present societies are essentially different, Jan Scholte argues that ever-increasing connectivity in human societies commenced with the earliest hominids leaving Africa, suggesting that any understanding of modern-day Globalization is best researched from a deep-past perspective.<sup>28</sup> Although most archaeologists and historians agree that all modern developments have to be seen from a *longue durée* perspective, the usefulness of the concept of Globalization for understanding past and even present-day societies has long been contested. Globalization theory has been criticized as being rooted in intellectual imperialism and having a Western cultural bias.<sup>29</sup> In the public eye, modern-day globalization is furthermore seen in a largely negative light, the assumption being that globalization leads to a homogenization and loss of cultural diversity, while the phenomenon itself is often seen as limited to the modern world with applications to earlier periods running the danger of distorting the evidence to fit into an inappropriate framework.<sup>30</sup>

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<sup>25</sup> Hopkins, A. G. *Globalization in World History*. New York: Norton, 2002, pp. 1-10.

<sup>26</sup> Arjun, Appadurai. "Disjuncture and Difference in the Global Cultural Economy." *Theory, Culture & Society* 7, no. 2-3 (1990): 295-310, p. 296.

<sup>27</sup> e.g., Nederveen Pieterse, Jan. "Globalization as Hybridization." In *Global Modernities*, edited by Mike Featherstone, 45-68. London: Sage, 1995.

<sup>28</sup> Scholte, Jan Aart. *Globalization: A Critical Introduction*. New York: Palgrave Macmillan, 2005.

<sup>29</sup> Smith, Claire, and Hans Martin Wobst. *Indigenous Archaeologies: Decolonizing Theory and Practice*. London; New York: Routledge, 2005.

<sup>30</sup> For an overview, consult Hodos, Tamar, Alexander Geurds, Paul Lane, Ian Lilley, Martin Pitts, Gideon Shelach, Miriam Stark, and Miguel John Versluys, eds. *The Routledge Handbook of Archaeology and Globalization*. London: Routledge, 2017, esp. "1.1. Globalization: Some Basics" by Tamar Hodos, pp. 3-11

The main argument made in archaeology for the application of both Globalization concepts and World Systems Theory is that local developments cannot be understood in and out of themselves, but that broader developments in wide-ranging networks and the integration of the local therein are best understood from large-scale perspectives and within broad historical frameworks.<sup>31</sup> Castells argued that increasing connectivity, far from leading to homogenization, invokes reactive resistance, “expressions of collective identity that challenge globalization and cosmopolitanism on behalf of cultural singularity and people’s control over their lives and environment.”<sup>32</sup> Increased connectivity thus influences local developments, leading to local changes and innovations by creating “productive friction”.<sup>33</sup> Picking up on this notion, Globalization concepts as applied to archaeology tend to work at several spatial scales simultaneous.

Justin Jennings emphasizes the importance of scale for both archaeological research and Globalization approaches, arguing that networks and various types of long- and short-distance connections already existed in early prehistory.<sup>34</sup> Over the last years, Globalization concepts have been applied to a wide range of archaeological material all around the world including the Americas, Europe, Africa, various parts of Asia, and the Eurasian steppe.<sup>35</sup> In many of these studies, Globalization approaches are seen as a way of discussing not just the actions of dominant centers or cores within networks, but also strategies developed by local agents. In this context, the term Glocalization is sometimes used, a concept that tries to overcome the tendency for Globalization to concentrate on large-scale processes by emphasizing the influence of local and individual agency on the global and vice versa.<sup>36</sup> In archaeological practice, this oftentimes leads to a focus on elites and their interconnectedness over long distances in the sense of elite cosmopolitanism, as their interactions are relatively easily recognizable through the circulation of exceptional objects over considerable distances.<sup>37</sup>

For instance, emphasizing the importance of glocalizing processes “that entail the creation of new foreign-derived yet locally accommodated materials”<sup>38</sup> with the concept of small-world networks, in their study on the Iron Age Eurasian steppe Brosseder and Miller show how local elites actively used a variety of items to establish and maintain numerous “weak ties” that together “spanned the continent”.<sup>39</sup> Like many other scholars applying Globalization theories to archaeology, they thus

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<sup>31</sup> *Ibd.*

<sup>32</sup> Castells, Manuel. *The Power of Identity*. Malden, Mass.: Blackwell Pub., 2004, p. 2.

<sup>33</sup> Tsing, Anna Lowenhaupt. *Friction: An Ethnography of Global Connection*. Princeton, N.J.: Princeton University Press, 2005.

<sup>34</sup> Jennings, Justin. *Globalizations and the Ancient World*. Cambridge; New York: Cambridge University Press, 2011.

<sup>35</sup> For a collection of case studies, consult Hodos, Tamar et al. *The Routledge Handbook of Archaeology and Globalization*. For a book-length study, see for instance Pitts, Martin, and M. J. Versluys. *Globalisation and the Roman World: World History, Connectivity and Material Culture*. 2015.

<sup>36</sup> Ritzer, George. "Rethinking Globalization: Glocalization/Globalization and Something/Nothing." *Sociological Theory* 21, no. 3 (2003): 193-209; Robertson, Roland, ed. *European Glocalization in Global Context*. New York: Palgrave Macmillan, 2014; Roudometof, Victor. *Glocalization: A Critical Introduction*. London: Routledge, 2016.

<sup>37</sup> A concept developed by Flood, Finbarr Barry. *Objects of Translation: Material Culture and Medieval "Hindu-Muslim" Encounter*. Princeton: Princeton University Press, 2009.

<sup>38</sup> Brosseder, Ursula, and Bryan K Miller. "Global Networks and Local Agents in the Iron Age Eurasian Steppe." In *Globalization in Prehistory: Contact, Exchange, and the 'People without History'*, edited by Nicole Boivin and Michael D. Frachetti, 162-83. Cambridge: Cambridge University Press, 2018, p. 167.

<sup>39</sup> Brosseder and Miller, "Global Networks", p. 177.

try and build a bridge between the large-scale view of continent-spanning developments and individual and group agency, including concepts of appropriation of foreign items and hybridity.

The 2017 publication of *The Routledge Handbook of Archaeology and Globalization*, a large volume with nearly 1,000 pages and 62 contributions, among them case studies from all over the world, makes it abundantly clear that in many areas of archaeology, especially on historical periods, globalization has become a new paradigm rather than a contested approach. The contributions also show that globalization is closely emmeshed with other major concepts discussed in connection with culture contact, most importantly appropriation, hybridity, and entanglement. Nederveen Pieterse even defines globalization as a “process of hybridization that gives rise to a global *mélange*”.<sup>40</sup> This process has often been seen as somewhat inevitable, coming about as a passive development without any agency from the parties involved, especially of colonized subjects; however, as Hodos has pointed out, hybridity is neither passive nor binary but is “a factor in the reorganization of social spaces and practices”.<sup>41</sup> Therefore, rather than being a matter of appropriation or homogenization, globalization processes are now generally seen as a matter of active creation, re-creation, and multi-focal hybridization. All of this takes place within the potential of constant mobility and connectivity which creates cultural entanglement.<sup>42</sup> Indeed, it was within the framework of globalization debates that the concept of entanglement came to prominence, and within the archaeological debate it furthermore came to be closely emmeshed with discussions on agency of both people and non-human actors.<sup>43</sup>

## Appropriation, Hybridity, and Entanglement

Silliman distinguishes between two types of (human) agency concepts, a simplified one that sees agents as rational actors wanting to maximize their economic or political capital (applied for instance in agent-based modelling),<sup>44</sup> and one that sees agents as “individuals acting meaningfully in historical and social circumstances only partly of their own making.”<sup>45</sup> For the encounter of human agents with foreign individuals, objects, and ideas, he emphasizes the importance of both “acts of resistance” and “acts of residence”, the latter being the selective appropriation of foreign traits. Archaeologists have long been aware of the complexities of adopting foreign technologies and materials,<sup>46</sup> and in recent years the concept of “appropriation” has become crucial in this

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<sup>40</sup> Nederveen Pieterse, Jan P. "Periodizing Globalization: Histories of Globalization." *New Global Studies* 6, no. 2 (2012): 67.

<sup>41</sup> Hodos, Tamar, Alexander Geurds, Paul Lane, Ian Lilley, Martin Pitts, Gideon Shelach, Miriam Stark, and Miguel John Versluys, eds. *The Routledge Handbook of Archaeology and Globalization*. London: Routledge, 2017, p. 5

<sup>42</sup> Knappett, Carl. "Globalization, connectivities and networks: An archaeological perspective". In *The Routledge Handbook of Archaeology and Globalization*, edited by Tamar Hodos et al., p. 29-41.

<sup>43</sup> E.g., Silliman, Stephen W. "Culture Contact or Colonialism? Challenges in the Archaeology of Native North America." *American Antiquity* 70, no. 1 (2005): 55-74.

<sup>44</sup> For an overview, consult Cegielski, Wendy H., and J. Daniel Rogers. "Rethinking the Role of Agent-Based Modeling in Archaeology." *Journal of Anthropological Archaeology* 41 (2016): 283-98.

<sup>45</sup> Silliman, Stephen W. "Agency, Practical Politics and the Archaeology of Culture Contact." *Journal of Social Archaeology* 1, no. 2 (2001): 190-209, p. 192, following concepts developed and applied by Ian Hodder and others (Hodder, Ian. *Reading the Past*. 2nd ed. Cambridge: Cambridge University Press, 1991).

<sup>46</sup> e.g., Lightfoot, "Culture Contact Studies."

context, meaning an active process of transforming the received traits and integrating them into local economic, political, social, and ideological structures.

These debates have been inspired by the anthropologist Igor Kopytoff's idea of the social life of things developed further by Appadurai, especially the thought that "What is significant about the adoption of alien objects – as of alien ideas – is not the fact that they are adopted, but the way they are culturally redefined and put to use".<sup>47</sup> Applying the concept to archaeology, Hans Peter Hahn defines four aspects of the process of appropriation: 1. transition of objects from wares to goods by becoming personal possessions; 2. objectivization by ascribing the object to an existing local category; 3. incorporation by defining the right way of handling them in the new context; 4. transformation by ascribing new meanings to them.<sup>48</sup>

Hahn also discusses the concept of hybridity as established by Homi Bhabha in his 1994 monograph *The Location of Culture*. Bhabha argues against the idea of cultures as stable units with clear boundaries, instead adopting the term hybridization from Edward Said and applying it in a colonial context, namely India. Bhabha emphasizes that in the emerging colonial society neither the British nor the Indian culture, norms, and values are entirely represented but both struggle for domination.<sup>49</sup> This struggle takes place in a "third space", which is not a physical location but a meeting place for people from different backgrounds. Bhabha focuses on colonial situations of unequal power and sees hybridity as both "a mode of appropriation and of resistance".<sup>50</sup> In this context, he uses the concept of translation (between cultural forms and between generations) as a way in which hybridity and difference are created, deliberate or through misunderstanding.

Reactions to Bhabha have been mixed. Hahn prefers the concept of hybridity over that of multiculturalism, criticizing the latter for failing to "explain how cultures mesh, intertwine and interlock."<sup>51</sup> Closely following Bhabha, he emphasizes the rejection of the ideology of purity within hybridity concepts, while for Stockhammer, hybridity "can only exist in opposition to purity", arguing that without purity, everything would be hybrid, hybridity thus becoming a redundant concept.<sup>52</sup> Indeed, many scholars criticize the concept of hybridity for being either so broadly applicable that it becomes useless, or valid only for specific cases with concepts of purity and origins "sneaking in through the back door."<sup>53</sup> Trying to address this issue, Werbner suggests

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<sup>47</sup> Kopytoff, Igor. "The Cultural Biography of Things: Commodization as a Process." In *The Social Life of Things: Commodities in Cultural Perspective*, edited by Arjun Appadurai, 64-91. Cambridge: Cambridge University Press, 1986, p. 67.

<sup>48</sup> Hahn, Hans Peter. "Global Goods and the Process of Appropriation." In *Between Resistance and Expansion: Explorations of Local Vitality in Africa*, edited by Peter Probst and Gerd Spittler. Beiträge zur Afrikaforschung, 211-29. Münster: LIT Verlag, 2004.

<sup>49</sup> Bhabha, Homi K. *The Location of Culture*. London; New York: Routledge, 1994.

<sup>50</sup> Bhabha, *The Location of Culture*, p. 172.

<sup>51</sup> Hahn, "Circulating Objects", p. 36.

<sup>52</sup> Stockhammer, *Conceptualizing Cultural Hybridization*, p. 1.

<sup>53</sup> Maran, Joseph. "One World Is Not Enough: The Transformative Potential of Intercultural Exchange in Prehistoric Societies." In *Conceptualizing Cultural Hybridization: A Transdisciplinary Approach*, edited by Philipp Stockhammer. Transcultural Research – Heidelberg Studies on Asia and Europe in a Global Context, 59-66. Heidelberg; New York: Springer, 2012, p. 60. For a similar sentiment, see also Liebmann, Matthew. "The Intersections of Archaeology and Postcolonial Studies." In *Archaeology and the Postcolonial Critique*, edited by Matthew Liebmann and Uzina Z. Rizvi, 1-20. Lanham: Altamira Press, 2008.

differentiating between intentional as opposed to organic hybridity as an unreflected process of borrowing.<sup>54</sup> Following Werbner, for archaeological research Maran sees value in the idea of intentional hybridity as a lever for major changes to the extant social order, but rejects the undifferentiated use of the term hybridity itself. Instead, he suggests focusing on agency operating through (cultural) translation, i.e. “discourses and practices through which the meaning of new foreign traits are made accessible in the course of the transfer from one society to another”, and social imagery, i.e., “ideas which groups have about themselves and others as well as about the world they live in”.<sup>55</sup>

Likewise arguing from an archaeological point of view, Stockhammer criticizes that the term hybridity is applied too broadly and unspecifically.<sup>56</sup> He suggests instead using the term “entanglement” in the sense of the German words “Geflecht” or “Verflechtung” comprising “aspects of agency, processuality and the creation of something new which is more than just an addition of its origins.”<sup>57</sup> This approach allows for agency and emphasizes process and action, however, the choice of the term entanglement is problematic. For one, the advantage of using the word “entanglement” as defined by Stockhammer vs cultural hybridization as defined by Bhabha remains unclear as Stockhammer himself sees the two as largely identical. More importantly, the term entanglement is not new in cultural theory but has been used in ways that markedly differ from its application by Stockhammer, meaning that his re-definition can lead to confusion.

The term entanglement originated with quantum physics for a phenomenon where the quantum state of two or more interacting particles cannot be adequately defined by describing the particles separately, but where the quantum state can only be delineated for the system as a whole.<sup>58</sup> Within anthropology, Thomas applied the term to objects being recontextualized within colonial encounters in a way that defies clear “us/them” dichotomies.<sup>59</sup> He emphasized the fluidity and situationality of such encounters and the elements of improvisation, resistance, and spontaneity within them. Applying the concept to colonial situations, Alexander used it to define one of three processes constituting his archaeological theory of culture contact: symmetrical interaction (symbiosis with no asymmetrical differences between the groups interacting), cultural entanglement (“a long-term, gradual, and non-directional process of interaction ... whereby interaction with an expanding territorial state gradually results in change of indigenous patterns of

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<sup>54</sup> Werbner, Pnina. "Introduction: The Dialectics of Cultural Hybridity." In *Debating Cultural Hybridity: Multi-Cultural Identities and the Politics of Anti-Racism*, edited by Pnina Werbner and Tariq Modood, 1-26. London: Zed Books, 1997.

<sup>55</sup> Maran, Joseph. "One World Is Not Enough", p. 62-63.

<sup>56</sup> Stockhammer, Philipp. "From Hybridity to Entanglement, from Essentialism to Practice." *Archaeological review from Cambridge* 28, no. 1 (2013): 11-28.

<sup>57</sup> Stockhammer, Philipp. "Conceptualizing Cultural Hybridization in Archaeology." In *Conceptualizing Cultural Hybridization: A Transdisciplinary Approach*, edited by Philipp Stockhammer. Transcultural Research: Heidelberg Studies on Asia and Europe in a Global Context, 43-58. Heidelberg; New York: Springer, 2012, p. 47.

<sup>58</sup> Jaeger, Gregg. *Quantum Entanglement, Information, and the Foundations of Quantum Mechanics*. Berlin: Springer, 2009.

<sup>59</sup> Thomas, Nicholas. *Entangled Objects: Exchange, Material Culture, and Colonialism in the Pacific*. Cambridge, Mass.: Harvard University Press, 1991.

production, exchange, and social relations”),<sup>60</sup> and colonization (as the extreme form with strong differences in power leading to conflicts).<sup>61</sup>

In the archaeology of culture contact only few people have taken up the concept of entanglement, and the term has mostly come to be used to identify trajectories “in which there are multiplying and continuously transforming entrapments emerging from interactions between humans and nonhumans”<sup>62</sup> rather than between humans from different backgrounds. This approach wants to draw attention to the materiality of entanglements, the “practical entrapments” which have been largely overlooked in anthropology. Integrating ideas of Bourdieu and Giddens on practice theory, Hodder argues that such entrapments in things occur because of embodied routine as well as issues of labor investment and resources. His ideas thus connect with the long-held interest of archaeological research in technological processes within the framework of *chaîne opératoire*, and the integration of technology within both social processes and the local environment, though Hodder himself discusses neither. On the micro level, the interest in individual objects and agencies has inspired a biographic approach to objects, trying to reconstruct their individual biographies, an approach inspired by Appadurai’s work and often applied to exceptional objects or “prestige goods”, and/or items from recent periods with available textual accounts rather than everyday items from pre-historic contexts.<sup>63</sup> In connection with research on culture contact, mechanisms of technology transfer have become the topic of much research.

## Technology Transfer and Archaeological Sciences

While research on local transmission of technology through teaching and learning is mainly explored through localized ethnoarchaeological research,<sup>64</sup> the transfer of technological knowledge between groups has usually been approached from the macroscopic perspective of long-distance spread of innovations such as agriculture and metallurgy. Indeed, this fascination, even obsession with finding the earliest occurrence of a given phenomenon has never vanished and continues to be fed by media headlines and the tendency for academic journals with a public appeal and high impact factor to prefer sensational discoveries.

Considering the concern with impact, its crucial importance in academic advancement, and the necessity for sensational results (or at least the promise thereof) for obtaining funding, this trend is

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<sup>60</sup> This definition of entanglement was adopted from Dietler, who later redefined it as an approach that analyzes “the complex webs of economic, political, social and cultural linkages that can result, often inadvertently, from the consumption of alien material culture.” Dietler, Michael. *Archaeologies of Colonialism: Consumption, Entanglement, and Violence in Ancient Mediterranean France*. Berkeley: University of California Press, 2010, p. 53.

<sup>61</sup> Alexander, Rani T. "Afterword: Toward an Archaeological Theory of Culture Contact." In *Studies in Culture Contact: Interaction, Culture Change, and Archaeology*, edited by James G. Cusick, 476-96. Carbondale: Southern Illinois University Press, 1998, p. 485.

<sup>62</sup> Der, Lindsay, and Francesca Fernandini, eds. *Archaeology of Entanglement*. Walnut Creek: Left Coast Press, 2016.

<sup>63</sup> Appadurai, Arjun, ed. *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge: Cambridge University Press, 1986, esp. Kopytoff, Igor. "The Cultural Biography of Things: Commodization as Process" in that volume, pp. 64-91. For debates in archaeology consult, e.g., Gosden, Chris, and Yvonne Marshall. "The Cultural Biography of Objects." *World Archaeology* 31, no. 2 (1999): 169-78; Joy, Jody. "Reinvigorating Object Biography: Reproducing the Drama of Object Lives." *World Archaeology* 41, no. 4 (2009): 540-56.

<sup>64</sup> David, Nicholas, and Carol Kramer. *Ethnoarchaeology in Action*. Cambridge, UK: Cambridge University Press, 2001.

not likely to disappear. It is therefore not surprising that long-refuted concepts of diffusionism and long-range migrations made a reappearance in recent years with scholars trying to explain the appearance of eastern crops (esp. millet) in the West and western crops (esp. wheat and barley) in the East through a combination of palaeobotany, isotope studies, and absolute dating; or the timing and rate of the spread of metallurgy from West to East through scientific dating of find contexts; or human movements across Eurasia and beyond through DNA analysis. The latter trend has received much criticism, with various scholars pointing out that connections between ancient DNA and archaeological material are not easy or straight-forward.<sup>65</sup> In connection with domesticated crops, however, the term diffusion is now used freely again, mostly without any reference to the underlying conceptual issues.<sup>66</sup>

At the same time, recent years have seen the emergence of fruitful interdisciplinary discussions on technological innovations and developments, their adoptions and adaptations, and the development of approaches and models for understanding all of these phenomena and their societal and material correlates. This applies in particular to metallurgy where exchange of technological knowledge, raw materials, and finished objects have been shown to form a particularly complex and far-reaching network not easily disentangled. Though some scholars still paint broad-brush images of clearly separated “metallurgical provinces” characterized by morphologically unified sets of artefacts, manufacturing processes, and raw material extraction and production centers,<sup>67</sup> most studies tend to question the existence of clear boundaries in any of these elements.<sup>68</sup>

Recent critiques of the obsession with questions of origins emphasize the concept of translation instead of diffusion.<sup>69</sup> These ideas relate back to research on local transmission of technology through teaching and learning, invoking concepts of practice theory and communities of practice.<sup>70</sup> In the same vein, Leppke, one of the contributors, calls for micro-regional research arguing that

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<sup>65</sup> See for instance Callaway, Ewen. "Divided by DNA: The Uneasy Relationship between Archaeology and Ancient Genomics." *Nature* 555, no. 7698 (2018): 573-76.

<sup>66</sup> See for instance Deng, Zhenhua, Hsiao-chun Hung, Xuechun Fan, Yunming Huang, and Houyuan Lu. "The Ancient Dispersal of Millets in Southern China: New Archaeological Evidence." *The Holocene* 28, no. 1 (2018): 34-43; Dong, Guanghui, Yishi Yang, Jianye Han, Hui Wang, and Fahu Chen. "Exploring the History of Cultural Exchange in Prehistoric Eurasia from the Perspectives of Crop Diffusion and Consumption." *Science China Earth Sciences* 60, no. 6 (June 01 2017): 1110-23; Frachetti, Michael D, Robert N Spengler, Gayle J Fritz, and Alexei N Mar'yashev. "Earliest Direct Evidence for Broomcorn Millet and Wheat in the Central Eurasian Steppe Region." *Antiquity* 84, no. 326 (2010): 993-1010; Hunt, Harriet V., Marc Vander Linden, Xinyi Liu, Giedre Motuzaitė-Matuzevičiūtė, Sue Colledge, and Martin K. Jones. "Millets across Eurasia: Chronology and Context of Early Records of the Genera *Panicum* and *Setaria* from Archaeological Sites in the Old World." *Vegetation History and Archaeobotany* 17, no. 1 (October 14 2008): 5.

<sup>67</sup> Chernykh, E. N., L. I. Avilova, T. B. Barceva, L. B. Orlovskaja, and T. O. Tenejsvili. "The Circumpontic Metallurgical Province as a System." *East and West* 41, no. 1-4 (1991): 11-45; Chernykh, E. N. "Metallurgical Provinces of Eurasia in the Early Metal Age: Problems of Interrelation." *ISIJ International* 54, no. 5 (2014): 1002-09.

<sup>68</sup> e.g., Hsu, Yiu-Kang, Peter J. Bray, Peter Hommel, A. Mark Pollard, and Jessica Rawson. "Tracing the Flows of Copper and Copper Alloys in the Early Iron Age Societies of the Eastern Eurasian Steppe." *Antiquity* 90, no. 350 (2016): 357-75; Pollard, A. Mark, Peter J. Bray, and Chris Gosden. "Is There Something Missing in Scientific Provenance Studies of Prehistoric Artefacts?" *Antiquity* 88, no. 340 (2014).

<sup>69</sup> E.g., Maran, Joseph, and Philipp Stockhammer, eds. *Appropriating Innovations: Entangled Knowledge in Eurasia, 5000-1500 BCE*. Oxford: Oxbow Books, 2017.

<sup>70</sup> Wenger, Etienne. *Communities of Practice: Learning, Meaning, and Identity*. Cambridge, U.K.; New York, N.Y.: Cambridge University Press, 1998; Wendrich, Willeke, ed. *Archaeology and Apprenticeship: Body Knowledge, Identity, and Communities of Practice*. Tucson: University of Arizona Press, 2012.

“innovations cannot usefully be studied in isolation but only in connection with pre-existing aspects of subsistence, environment, social structures, beliefs, transmission mechanisms”.<sup>71</sup> Following Burmeister,<sup>72</sup> Leppek furthermore distinguishes between innovations and inventions, the latter referring to something genuinely new, the former focusing on appropriation and adaptation to the local context. Leppek argues that if we shift our focus “from ‘earliest emergence’ to ‘specific local appropriation’”, the big picture would automatically emerge as a by-product of such micro-regional analyses.<sup>73</sup> In practice, however, the issue of how to integrate macro and micro and intermediate scales as well as different kinds of actors and structures operating at these different levels remains unsolved.

One promising solution that has been gaining traction in recent years is network analysis, another one is the greater emphasis on materiality. Within the recent material turn in archaeology – and the humanities and social sciences in general – the focus has shifted from the “meaning” or “function” of objects to objects as agents whose materiality and affordances play a major role in contact situations independent of the intentions of human agents.<sup>74</sup> The issue of materiality and how it shapes human behaviour has long been of importance in research on technology, in particular ceramic technology which has seen much ethnoarchaeological and experimental work, but also metallurgy and other techniques that involve human agents, natural raw materials, laws of physics, but also objects – both products and tools used in making them – that shape the ways humans may act. In this context, limitations of raw materials beyond any human choice are clearly apparent, however, the material turn has likewise been helpful in working against colonialist attitudes in research on culture contact and identity formation in various parts of the world, focusing on materiality and connecting it with concepts of hybridity and agency on the part of material culture and humans alike, rather than emphasizing the actions of the colonizer or even the colonized.<sup>75</sup> Furthermore, in recent years nonhuman actors have been given equal weight to human actors also in network theory modelling a wide range of different processes. In the context of Aegean Bronze Age elite exchange networks, for instance, Knappett has pointed out that agency was contingent on networks of interconnections between people, artefacts, pictures, and texts.<sup>76</sup> Therefore, he

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<sup>71</sup> Leppek, Maleen. "Innovation, Interaction and Society in Europe in the 4th Millenium BCE: The 'Traction Complex' as Innovation and 'Technology Cluster'." In *Appropriating Innovations: Entangled Knowledge in Eurasia, 5000-1500 Bce*. Oxford, edited by Joseph Maran and Philipp Stockhammer, 98-108. Oxford: Oxbow Books, 2017, p. 101.

<sup>72</sup> Burmeister, Stefan. "Migration – Innovation – Kulturwandel. Aktuelle Problemfelder Archäologischer Investigation." In *Mobilität Und Wissenstransfer in Diachroner Und Interdisziplinärer Perspektive*, edited by Elke Kaiser and Wolfram Schier, 35-58. Berlin: De Gruyter, 2013.

<sup>73</sup> Leppek, "Innovation", p. 101.

<sup>74</sup> See for instance DeMarrais, Elizabeth, Chris Gosden, and Colin Renfrew, eds. *Rethinking Materiality : The Engagement of Mind with the Material World*. Cambridge: David Brown Book Co., 2004; Knappett, Carl, and Lambros Malafouris, eds. *Material Agency: Towards a Non-Anthropocentric Approach*. Berlin: Springer, 2008; Malafouris, Lambros, and Colin Renfrew, eds. *The Cognitive Life of Things: Recasting the Boundaries of the Mind*. Cambridge: McDonald Institute for Archaeological, 2010.

<sup>75</sup> See for instance Dommelen, Peter Alexander René van, and Arthur Bernard Knapp, eds. *Material Connections in the Ancient Mediterranean : Mobility, Materiality, and Mediterranean Identities*. Abingdon, Oxon; New York: Routledge, 2010.

<sup>76</sup> Knappett, Carl. "The Neglected Networks of Material Agency: Artefacts, Pictures and Texts." In *Material Agency: Towards a Non-Anthropocentric Approach*, edited by Carl Knappett and Lambros Malafouris, Berlin: Springer, 2008, pp. 139-156.

argued, a shift of emphasis was necessary that need not be “dehumanising or deindividualizing”, as he put it, but needed to be less anthropocentric.

## Spatial Analysis and Network Models

Network science as defined in the 2013 inaugural issue of a new journal of the same name is “the study of the collection, management, analysis, interpretation, and presentation of relational data” and “the study of network models”.<sup>77</sup> Network models represent “the conceptual process researchers go through, explicitly or implicitly, in deciding whether the phenomena under investigation can be usefully abstracted using network concepts and represented as network data”.<sup>78</sup>

Network analysis thus differs from GIS applications in that its graphs do not reflect actual spatial distances, though geospatial and environmental components can be taken into account. It thus avoids directionality, spatial determinism, or the urge to define centers/peripheries or boundaries, and it can technically work at several spatial scales at once.<sup>79</sup> A recent review of GIS in archaeology has a whole chapter on network analysis where the authors express their view that the two approaches might be combined;<sup>80</sup> in practice however, when it comes to contacts, GIS applications tend to focus on geomorphology and resource availability, while network analysis usually explores social connections. The network approach most often cited in archaeology concerns small-world networks originally developed in physics as a model in which most nodes are not directly linked but are all reachable via other nodes.<sup>81</sup> Such a concept is extremely attractive to archaeologists interested in the transfer of objects and knowledge over long distances without assuming or needing the presence of a strong core or dominating central force.<sup>82</sup>

Commonly applied network approaches in archaeology are Actor-Network Theory (ANT) and Social Network Analysis (SNA). SNA was developed in quantitative sociology to analyze social connections through network models consisting of nodes representing individual actors (human or non-human) and ties/links showing their relationships. Such models are often displayed in sociograms and are particularly popular for analyzing and displaying social media interactions, friendships, and information exchange.<sup>83</sup> The focus is thus on relationships rather than other attributes of the actors involved. SNA provides a way of measuring and visualizing interconnections and “evaluating the implications of those relationships”, while its quantitative

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<sup>77</sup> Brandes, Ulrik, Garry Robins, Ann McCranie, and Stanley Wasserman. "What Is Network Science?" *Network Science* 1, no. 1 (2013): 1-15, p. 2 and 4.

<sup>78</sup> Collar, Anna, Fiona Susan Coward, Tom Brughmans, and Barbara J. Mills. "Networks in Archaeology: Phenomena, Abstraction, Representation." *Journal of Archaeological Method and Theory* 22, no. 1 (2015): 1-32, p. 4.

<sup>79</sup> Discussed in detail e.g. in Knappett, Carl, ed. *Network Analysis in Archaeology: New Approaches to Regional Interaction*. Oxford: Oxford University Press, 2013.

<sup>80</sup> Connolly, James, and Mark Lake, eds. *Geographical Information Systems in Archaeology*, Cambridge Manuals in Archaeology. Cambridge, UK; New York: Cambridge University Press, 2006.

<sup>81</sup> Watts, Duncan J., and Steven H. Strogatz. "Collective Dynamics of 'Small-World' Networks." *Nature* 393, no. 6684 (1998): 440-2.

<sup>82</sup> See e.g., Brosseder and Miller, "Global Networks".

<sup>83</sup> Missaoui, Rokia, and Idrissa Sarr. *Social Network Analysis - Community Detection and Evolution*. Cham: Springer International Publishing, 2015.

nature allows for “objectively comparing social systems with one another”,<sup>84</sup> or so it is hoped. Proponents of SNA in archaeology point out that it helps moving away from trait lists and single sites as well as the dominance of spatial proximity, and focus instead on connections other than spatial proximity; that it provides a set of formal methods for network-thinking rather than using network as a vague metaphor; and that its dynamic nature allows for time depth so essential for archaeology but often missing in other approaches developed in sociology or cultural anthropology.<sup>85</sup> Mills and colleagues especially emphasize concepts of centrality, embeddedness, strength of ties and structural holes, presence of cliques/subgroups, and diffusion and cultural influence as useful to archaeology,<sup>86</sup> but they all come with their own set of issues.

Though the emphasis on connections is useful, their assessment is still based on attribute lists defining each actor within the network. Furthermore, all too easily core/periphery thinking and ill-defined notions of diffusion can sneak in, as can assumptions concerning the natural attractiveness of more “advanced” technologies and the inevitable assimilation of more “primitive” groups by polities of “higher social complexity”, as seen for instance in Mizoguchi’s work on Yayoi and Kofun period Japan.<sup>87</sup> Other criticisms commonly raised are that SNA has a bias toward interpersonal relationships while archaeology works on the object and site-level.<sup>88</sup> Another issue is the lack of attention to materiality and the low priority of geographic and environmental components which are all crucial in archaeology. Furthermore, the incomplete nature of the archaeological record and the lack of precise information on the links that are easily reconstructed in sociological studies make the application of SNA difficult and the conclusions reached trivial, confirming what is already known rather than providing new insights.<sup>89</sup>

Sindbæk thus argues that archaeologists cannot conduct network analysis as that would require knowing the links, but rather network reconstruction or what he calls “network synthesis”.<sup>90</sup> Thus, SNA which requires a sure knowledge of the links, might not be an appropriate approach. Knappett prefers network science approaches from physics concerned with development over time and space and focused on non-human entities as actors.<sup>91</sup> ANT was developed in science and technology and thus emphasizes the integration of human and nonhuman actors, taking a material-semiotic

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<sup>84</sup> Gjesfield, Erik, and S. Colby Phillips. "Evaluating Adaptive Network Strategies with Geochemical Sourcing Data: A Case Study from the Kuril Islands (Japan)." In *Network Analysis in Archaeology: New Approaches to Regional Interactions*, edited by Carl Knappett, 281-301. Oxford: Oxford University Press, 2013, p. 284.

<sup>85</sup> Mills, Barbara J., John M. Jr. Roberts, Jeffrey J. Clark, William R. Jr. Haas, Deborah L. Huntley, Matthew A. Peeples, Lewis Borck, et al. "The Dynamics of Social Networks in the Late Prehispanic U.S. Southwest." In *Network Analysis in Archaeology: New Approaches to Regional Interactions*, edited by Carl Knappett, 181-99. Oxford: Oxford University Press, 2013.

<sup>86</sup> Mills et al., “The Dynamics”, p. 181.

<sup>87</sup> Mizoguchi, Koji. "The Evolution of Prestige Good Systems: An Application of Network Analysis to the Transformation of Communication Systems and Their Media." In *Network Analysis in Archaeology: New Approaches to Regional Interaction*, edited by Carl Knappett, 151-78. Oxford: Oxford University Press, 2013.

<sup>88</sup> Brughmans, Tom, Anna Collar, and Fiona Susan Coward. "Network Perspectives on the Past: Tackling the Challenges: Introduction." In *The Connected Past: Challenges to Network Studies in Archaeology and History*, edited by Tom Brughmans, Anna Collar and Fiona Susan Coward, 3-20. Oxford: Oxford University Press, 2016.

<sup>89</sup> Knappett, *Network Analysis*, p. 6; Mills et al., “The Dynamics.”

<sup>90</sup> Sindbæk, Søren. "Broken Links and Black Boxes: Material Affiliations and Contextual Network Synthesis in the Viking World." In *Network Analysis in Archaeology: New Approaches to Regional Interaction*, edited by Carl Knappett, 71-94. Oxford: Oxford University Press, 2013.

<sup>91</sup> Knappett, *Network Analysis*.

approach that integrates things and concepts into one system.<sup>92</sup> In archaeology, ANT has been applied in studies of technology, for instance by Leppek for the study of what he calls the “traction complex.” He argues that “technologies are never isolated phenomena but are invariably embedded in an environment with which they form an interactive network involving both human and non-human agents”, a conceptualization of technology for which ANT is particularly suitable.<sup>93</sup> Knappett points out that ANT has stayed rather theoretical with little elaboration on the network aspect, while SNA lacks “the commitment to treating the interactions of humans and objects symmetrically”; thus he suggests combining the two to “bring together people and things”.<sup>94</sup> Since then, however, Astrid van Oyen published a book-length study on *How Things Make History: The Roman Empire and Its Terra Sigillata Pottery* which successfully applies ANT to archaeological material, approaching pottery production, consumption, and trade within a relation-based framework.<sup>95</sup> The study emphasizes the role of terra sigillata not just as a ‘history-teller’ but also a ‘history-maker’, shaping historical trajectories, i.e. the pathways along which events may unfold and which are shaped by the nature of objects and how they may be traded and consumed.

In spite of all enthusiasm for network science and its potential for exploring far-ranging interactions, its application to archaeology still grapples with many issues, especially the technical difficulties leading to inappropriate or poorly reflected applications of the method, the need for precisely defined units and clear chronologies that archaeology oftentimes cannot provide, the issues with the assumptions and simplifications necessary for applying network analysis, and the crucial question of what network approaches can add beyond what other methods already provide.<sup>96</sup> Indeed, as studies mentioned in previous sections and many others have shown, it is entirely possible to explore issues of culture contact in the past successfully without adopting formal network approaches. For archaeology, however, the interdisciplinary nature of recent discussions on network analysis is particularly important as they connect scholars from various fields across the humanities, social sciences, and even hard sciences, a connection particularly fruitful for research on culture contact recent research trends show.

## Current Research Trends

Recent years have seen an increase in multi-disciplinary, multi-source research tracing the spread of (new) domesticates, technologies, raw materials, and to a lesser extent final products.<sup>97</sup> Changes

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<sup>92</sup> Latour, Bruno. *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press, 2005.

<sup>93</sup> Leppek. "Innovation".

<sup>94</sup> Knappett, Carl. *An Archaeology of Interaction: Network Perspectives on Material Culture and Society*. Oxford; New York: Oxford University Press, 2011, p. 8.

<sup>95</sup> Van Oyen, Astrid. *How Things Make History: The Roman Empire and Its Terra Sigillata Pottery*. Amsterdam Archaeological Studies 23. Amsterdam: Amsterdam University Press, 2016.

<sup>96</sup> For a summary of issues and challenges in the application of network sciences in archaeology consult Brughmans, Tom, Anna Collar, and Fiona Susan Coward, eds. *The Connected Past: Challenges to Network Studies in Archaeology and History*. Oxford: Oxford University Press, 2016, esp. the introductory chapter.

<sup>97</sup> E.g., Higham, Charles F. W. "The Later Prehistory of Southeast Asia and Southern China: The Impact of Exchange, Farming and Metallurgy." *Asian Archaeology* (2021). <https://doi.org/10.1007/s41826-021-00040-y>; Nelson, Sarah,

in subsistence practices in particular, their link to the movement of people and goods on the one hand and climate fluctuations on the other, have been the subject of heated discussions.<sup>98</sup> In terms of population movement, there has been a focus on scientific data, especially ancient DNA and isotope work. Our understanding of early human origins and the spread of homo sapiens, most of it based on ancient DNA work, is changing rapidly.<sup>99</sup> Recent advances in genomics have radically changed our understanding of the movement of individuals and specific sub-groups of communities as well as inter-marriage patterns. A recent study astonishing in its detailed insights into individual movements and their socio-cultural motives, has shown that in the German Lech River Valley during the Late Neolithic and Early/Middle Bronze Age, men stayed with their birth communities while women were highly mobile and the agents behind supra-regional communication and exchange – quite contrary to the long-held assumption of the roaming men and home-bound women.<sup>100</sup> While it is fascinating to see how new scientific data can reveal direct kinship relations over hundreds of years and identify persisting residential rules across a divide in archaeological cultures (in this case Bell Beaker Complex to Early Bronze Age), such studies raise questions about the relationship between shared cultural identity, material culture, and biological relations. While

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Irina Zhushchikhovskaya, Tao Li, Mark Hudson, and Martine Robbeets. "Tracing Population Movements in Ancient East Asia through the Linguistics and Archaeology of Textile Production." *Evolutionary Human Sciences* 2 (2020): e5 e5; Wu, Xiaotong, Anke Hein, Xingxiang Zhang, Zhengyao Jin, Dong Wei, Fang Huang, and Xijie Yin. "Resettlement Strategies and Han Imperial Expansion into Southwest China: A Multimethod Approach to Colonialism and Migration." *Archaeological and Anthropological Sciences* 11, no. 12 (2019): 6751-81.

<sup>98</sup> E.g., Brunson, Katherine, Ren Lele, Zhao Xin, Dong Xiaoling, Wang Hui, Zhou Jing, and Rowan Flad. "Zooarchaeology, Ancient mtDNA, and Radiocarbon Dating Provide New Evidence for the Emergence of Domestic Cattle and Caprines in the Tao River Valley of Gansu Province, Northwest China." *Journal of Archaeological Science: Reports* 31 (2020): 102262; d'Alpoim Guedes, J., and R. K. Bocinsky. "Climate Change Stimulated Agricultural Innovation and Exchange across Asia." *Science advances* 4, no. 10 (2018): 4491-503; Dong, Guanghui, Yishi Yang, Jianye Han, Hui Wang, and Fahu Chen. "Exploring the History of Cultural Exchange in Prehistoric Eurasia from the Perspectives of Crop Diffusion and Consumption." journal article. *Science China Earth Sciences* 60, no. 6 (2017): 1110-23; Dong, Guanghui, Yishi Yang, Xinyi Liu, Haiming Li, Yifu Cui, Hui Wang, Guoke Chen, John Dodson, and Fahu Chen. "Prehistoric Trans-Continental Cultural Exchange in the Hexi Corridor, Northwest China." *The Holocene* 28, no. 4 (2018): 621-28; Jaffe, Yitzchak Y, and Anke Hein. "Considering Change with Archaeological Data: Reevaluating Local Variation in the Role of the ~4.2k Bp Event in Northwest China." *The Holocene* 31, no. 2 (2020): 169-82; Qu, Yating, Xingjun Hu, Tingting Wang, and Yimin Yang. "Early Interaction of Agropastoralism in Eurasia: New Evidence from Millet-Based Food Consumption of Afanasyevo Humans in the Southern Altai Mountains, Xinjiang, China." *Archaeological and Anthropological Sciences* 12, no. 8 (2020): 195.

<sup>99</sup> Bergström, Anders, Chris Stringer, Mateja Hajdinjak, Eleanor M. L. Scerri, and Pontus Skoglund. "Origins of Modern Human Ancestry." *Nature* 590, no. 7845 (2021): 229-37; Higham, Thomas. *The World before Us : How Science Is Revealing a New Story of Our Human Origins*. London: Viking, 2021.

<sup>100</sup> Eisenmann, Stefanie, Eszter Bánffy, Peter van Dommelen, Kerstin P. Hofmann, Joseph Maran, Iosif Lazaridis, Alissa Mittnik, Michael McCormick, Johannes Krause, David Reich, and Philipp W. Stockhammer. "Reconciling Material Cultures in Archaeology with Genetic Data: The Nomenclature of Clusters Emerging from Archaeogenomic Analysis." *Scientific Reports* 8, no. 1 (29 2018): 13003; Knipper, Corina, Alissa Mittnik, Ken Massy, Catharina Kociumaka, Isil Kucukkalipci, Michael Maus, Fabian Wittenborn, Stephanie E. Metz, Anja Staskiewicz, Johannes Krause, and Philipp W. Stockhammer. "Female Exogamy and Gene Pool Diversification at the Transition from the Final Neolithic to the Early Bronze Age in Central Europe." *Proceedings of the National Academy of Sciences* (2017): 201706355; Mittnik, Alissa, Ken Massy, Corina Knipper, Fabian Wittenborn, Ronny Friedrich, Saskia Pfrengle, Marta Burri, Nadine Carlich-Witjes, Heidi Deeg, Anja Furtwängler, Michaela Harbeck, Kristin von Heyking, Catharina Kociumaka, Isil Kucukkalipci, Susanne Lindauer, Stephanie Metz, Anja Staskiewicz, Andreas Thiel, Joachim Wahl, Wolfgang Haak, Ernst Pernicka, Stephan Schiffels, Philipp W. Stockhammer, and Johannes Krause. "Kinship-Based Social Inequality in Bronze Age Europe." *Science* 366, no. 6466 (2019): 731-34.

the authors of the Lech-River study focused on individual communities, using terms such as “Bell Beaker” mostly to designate dates or specific ceramics while not suggesting links to established archaeological cultures, not all scholars are that careful. As criticized by Eisenmann and colleagues, recent DNA studies have often borrowed archaeological cultural designations to name genetic groups without discussing or even being aware of the problematic nature of culture concepts in archaeology.<sup>101</sup>

Similar issues plague research on long-distance human movement, the spread of (new) domesticates, changes in subsistence practices, and their connection with climate shifts based on bioarchaeological data. Especially isotope studies have been greatly successful in reconstructing the movements and subsistence patterns of individuals and small communities,<sup>102</sup> but it has proven difficult to paint medium-resolution pictures. Additionally, large-scale models have a tendency to make simplistic links between often poorly defined archaeological cultures and specific bioarchaeological phenomena. While isotopes say much about nutrition and can help identify individuals as non-local, pinpointing their actual place of origin is notoriously difficult,<sup>103</sup> and the use of craniometric data as widely applied for instance in the bioarchaeology of East Asia<sup>104</sup> comes with a considerable historical baggage and ethical as well as methodological issues.<sup>105</sup> Beyond these problems, bioarchaeological reconstructions of population history by nature tend to be broad-brush, using cultural assignments loosely without investigating the connection between cultural and biological evidence.<sup>106</sup> Pointing out the fluidity of identities and the complexity of culture contact, for the case of early China, Elizabeth Berger mentions the persistent issue of scholars equating ethnic groups mentioned in later transmitted texts with archaeological cultures and racial sub-groups identified based on craniometry.<sup>107</sup> Her careful study on bioarchaeological markers of health, trauma, stature, and fertility provides detailed insights into an incremental adaptation to climate change in Bronze Age Northwest China with sociocultural factors serving as a buffer

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<sup>101</sup> Eisenmann, Stefanie, Eszter Bánffy, Peter van Dommelen, Kerstin P. Hofmann, Joseph Maran, Iosif Lazaridis, Alissa Mittnik, *et al.* "Reconciling Material Cultures in Archaeology with Genetic Data: The Nomenclature of Clusters Emerging from Archaeogenomic Analysis." *Scientific Reports* 8, no. 1 (2018): 13003.

<sup>102</sup> E.g. Guo, Yi, Jie Lou, Chen Xiang, Yang Xia, and Xinmin Xu. "Investigating Dietary Patterns and Human Mobility in Bone Apatite at the Zhuangqiaofen Site (5000-3700 Bp), Zhejiang Province, China." *Quaternary International* 493 (2018/11/10/ 2018): 245-51; Wu, Xiaotong, Anke Hein, Xingxiang Zhang, Zhengyao Jin, Dong Wei, Fang Huang, and Xijie Yin. "Resettlement Strategies and Han Imperial Expansion into Southwest China: A Multimethod Approach to Colonialism and Migration." journal article. *Archaeological and Anthropological Sciences* 11, no. 12 (December 01 2019): 6751-81.

<sup>103</sup> For a summary of the issue consult e.g. Wu *et al.*, "Resettlement."

<sup>104</sup> For a comprehensive summary consult Pechenkina, Ekaterina A., Marc Oxenham, and Clark Spencer Larsen. *Bioarchaeology of East Asia: Movement, Contact, Health*. Bioarchaeological Interpretations of the Human Past: Local, Regional, and Global Perspectives. Gainesville: University Press of Florida, 2013.

<sup>105</sup> See e.g. Gould, Stephen Jay. *Der Falsch Vermessene Mensch*. Frankfurt: Suhrkamp, 2016; for a recent more positive reassessment of the method see Lewis, Jason E., David Degusta, Marc R. Meyer, Janet M. Monge, Alan E. Mann, and Ralph L. Holloway. "The Mismeasure of Science: Stephen Jay Gould Versus Samuel George Morton on Skulls and Bias." *PLoS biology* 9, no. 6 (2011): e1001071-e71.

<sup>106</sup> Pointed out for instance in Douglas, Michele Toomay. "Bioarchaeology of East Asia: Movement, Contact, Health." *The Journal of Island and Coastal Archaeology* 9, no. 3 (2014/09/02 2014): 445-47.

<sup>107</sup> E.g. Zhao Yongsheng 赵永生, Mao Ruilin 毛瑞林, and Zhu Hong 朱泓. "Cong Mogou zu kan Ganqing diqu gudai jumin tizhi tezheng de yanbian" 从磨沟组看甘青地区古代居民体质特征的演变. *Dongfang kaogu 东方考古* 11 (2014):284-301.

against environmental stressors.<sup>108</sup> Nevertheless, the study uses archaeological culture names as convenient labels for groups of data without investigating the behavioral patterns behind the differences in material culture; likewise, the nature of contact between different communities throughout Northwest China remains unexplored.

Similarly, the large number of papers on the routes and timing of crop diffusion across Eurasia and the environmental correlates for their adaptation in Northwest China in particular often gloss over the cultural component of this spread and these changes.<sup>109</sup> Where human mobility – rather than crop or animal mobility – is discussed, the studies tend to be localized<sup>110</sup> and/or extremely careful to refer to period and place names rather than archaeological cultures, emphasizing shared subsistence practices and places of residence rather than shared material culture or burial customs.<sup>111</sup> Interestingly, for new domesticates as well as various technologies, recent research has shown that often cultural and social more so than environmental factors determine what spread, got adopted, or modified, so explanations relying on climate modelling alone may lead to faulty conclusions.<sup>112</sup> For instance, it has become clear that widely-held assumptions of innovations spreading from cores to peripheries or being transmitted between elites in various central locations are probably not tenable. Indeed, multi-resource and multi-technology practices often emerge in

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<sup>108</sup> Berger, Elizabeth S. "Bioarchaeology of Adaptation to Climate Change in Ancient Northwest China." PhD Dissertation, The University of North Carolina at Chapel Hill, 2017.

<sup>109</sup> E.g. Cheung, C., H. Zhang, J. C. Hepburn, D. Y. Yang, and M. P. Richards. "Stable Isotope and Dental Caries Data Reveal Abrupt Changes in Subsistence Economy in Ancient China in Response to Global Climate Change." *PLoS one* 14, no. 7 (2019): e0218943; Dong, Guanghui, Yishi Yang, Jianye Han, Hui Wang, and Fahu Chen. "Exploring the History of Cultural Exchange in Prehistoric Eurasia from the Perspectives of Crop Diffusion and Consumption." journal article. *Science China Earth Sciences* 60, no. 6 (June 01 2017): 1110-23; Dong, Guanghui, Yishi Yang, Xinyi Liu, Haiming Li, Yifu Cui, Hui Wang, Guoke Chen, John Dodson, and Fahu Chen. "Prehistoric Trans-Continental Cultural Exchange in the Hexi Corridor, Northwest China." *The Holocene* 28, no. 4 (2018): 621-28.

<sup>110</sup> E.g. Brunson, Katherine, Ren Lele, Zhao Xin, Dong Xiaoling, Wang Hui, Zhou Jing, and Rowan Flad. "Zooarchaeology, Ancient Mtdna, and Radiocarbon Dating Provide New Evidence for the Emergence of Domestic Cattle and Caprines in the Tao River Valley of Gansu Province, Northwest China." *Journal of Archaeological Science: Reports* 31 (2020/06/01/ 2020): 102262.; Guo, Yi, Jie Lou, Chen Xiang, Yang Xia, and Xinmin Xu. "Investigating Dietary Patterns and Human Mobility in Bone Apatite at the Zhuangqiaofen Site (5000-3700 Bp), Zhejiang Province, China." *Quaternary International* 493 (2018): 245-51.

<sup>111</sup> d'Alpoim Guedes, J., and R. K. Bocinsky. "Climate Change Stimulated Agricultural Innovation and Exchange across Asia." *Science advances* 4, no. 10 (2018): 4491-503.

<sup>112</sup> For domesticates and food preparation methods see: Fuller, Dorian Q., Christina Cobo Castillo, and Charlene Murphy. "How Rice Failed to Unify Asia: Globalization and Regionalism of Early Farming Traditions in the Monsoon World." In *The Routledge Handbook of Globalization and Archaeology*, edited by T. Hodos, Alexander Geurds, P. Lane, Ian Lilley, Martin Pitts, Gideon Shelach, Miriam Stark and M. J. Versluys, 711-29, 2017; for metallurgy see: Hsu, Yiu Kang, Benjamin Sabatini, Noost Bayarkhuu, Tsagaan Turbat, Pierre-Henri Giscard, and Sabine Klein. "Discerning Social Interaction and Cultural Influence in Early Iron Age Mongolia through Archaeometallurgical Investigation." *Archaeological and Anthropological Sciences* 12, no. 1 (2020): 11 ; Liu, R., Y. K. Hsu, A. M. Pollard, and G. Chen. "A New Perspective Towards the Debate on Highly Radiogenic Lead in Chinese Archaeometallurgy." *Archaeological and Anthropological Sciences* 13, no. 2 (2021): 33.; for ceramic technology consult e.g. Womack, Andrew, Rowan Flad, Jing Zhou, Katherine Brunson, Fabian H. Toro, Xin Su, Anke Hein, et al. "The Majiayao to Qijia Transition: Exploring the Intersection of Technological and Social Continuity and Change." *Asian Archaeology* (2021). <https://doi.org/10.1007/s41826-021-00041-x>.

more marginal areas rather than seemingly more ideal environments such as fertile low-elevation plains.<sup>113</sup>

The overall tendency to focus on scientific data and environmental aspects to paint broad-brush pictures of sudden shifts in lifeways following climatic changes have recently been criticized by scholars pointing out differing localized responses and individual/group agencies, calling for a return to archaeological fundamentals and large-scale intensive fieldwork and interdisciplinary studies involving archaeologists, paleobotanists, zooarchaeologists, isotope specialists, and climate scientists.<sup>114</sup> Such collaborations require further method development on all sides, and it also necessitates using all available strands of evidence and testing them against each other.<sup>115</sup> After all, even scientific data, though numerical and suitable to be explored through graphs and statistics, are the results of various factors and processes, including underlying assumptions about the nature of human behavior broadly speaking, including human-environment, human-object, and human-human interaction. Furthermore, they tend to mask variation in the availability of archaeological data. Especially in big-picture narratives covering large areas, data quality varies widely between places, and chronologies are often not well-developed or insufficiently anchored in scientific dates. One way forward is targeting single sites or at most small regions and conduct high-quality highly specialized research in various locals until data quality becomes sufficient to start building medium-level and finally large-scale narratives, but this might mean forgoing big-picture debates for many decades to come. While this may seem like a sound – though somewhat slow – approach, the fact remains that contact is ubiquitous, meaning that even small- let alone medium-scale studies cannot ignore outside connections.

This issue also applies to studies of technological transfer and innovation as well as circulation of raw materials. Combining scientific and archaeological data, Chen et al. for instance discuss the emergence of metallurgy in China not as an origins story but with a focus on diachronic and cross-spatial developmental processes.<sup>116</sup> They move away from the idea of discrete archaeological

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<sup>113</sup> E.g. Chen Kunlong, Mei Jianjun, Wang Lu, and Anke Hein. "Interaction and Localisation: New Insights into Early Metallurgy in China." *Journal of World History* (forthcoming); Fuller, Dorian Q., Leilani Lucas, Nicole Boivin, Michael Petraglia, and Remy Crassard. "Adapting Crops, Landscapes, and Food Choices: Patterns in the Dispersal of Domesticated Plants across Eurasia." In *Human Dispersal and Species Movement: From Prehistory to the Present*, 304-31. Cambridge: Cambridge University Press, 2017.

<sup>114</sup> E.g. Jaffe, Yitzchak Y, and Anke Hein. "Considering Change with Archaeological Data: Reevaluating Local Variation in the Role of the ~4.2k Bp Event in Northwest China." *The Holocene* 31, no. 2 (2020): 169-82; Womack, Andrew, Rowan Flad, Jing Zhou, Katherine Brunson, Fabian H. Toro, Xin Su, Anke Hein, et al. "The Majiayao to Qijia Transition: Exploring the Intersection of Technological and Social Continuity and Change." *Asian Archaeology* (2021). <https://doi.org/10.1007/s41826-021-00041-x>.

<sup>115</sup> E.g. Knipper et al. "Female exogamy"; Fuller, Dorian Q., Leilani Lucas, Nicole Boivin, Michael Petraglia, and Remy Crassard. "Adapting Crops, Landscapes, and Food Choices: Patterns in the Dispersal of Domesticated Plants across Eurasia." In *Human Dispersal and Species Movement: From Prehistory to the Present*, 304-31: Cambridge University Press : Cambridge, 2017; Ventresca Miller, Alicia R., and Cheryl A. Makarewicz. "Intensification in Pastoralist Cereal Use Coincides with the Expansion of Trans-Regional Networks in the Eurasian Steppe." *Scientific Reports* 9, no. 1 (2019): 8363; Ventresca Miller, A. R., J. A. Johnson, S. Makhortykh, L. Litvinova, T. Taylor, R. Rolle, and C. A. Makarewicz. "Mobility and Diet in the Iron Age Pontic Forest-Steppe: A Multi-Isotopic Study of Urban Populations at Bel'sk." *Archaeometry* 61, no. 6 (2019): 1399-416.

<sup>116</sup> Chen et al. "Interaction and Localisation."

cultures – in China usually defined based on ceramic typologies<sup>117</sup> – and instead highlight localized practices crosscutting other behavioral patterns, arguing that these local practices are crucial for the transmission of metallurgy throughout Eurasia. Instead of relying solely on object typology or elemental composition, they emphasize the importance of combining scientific techniques and conceptual considerations, taking into account material composition, manufacturing techniques, object forms and function, production scales and organization, in short, the whole chaîne opératoire of both production and use.

Similarly, the aptly named FLAME (Flow of Ancient Metal across Eurasia) project has moved away from individual cultural assignments and even the search for specific metal sources to investigate both the spread of metal technologies and the flow of associated raw materials across Eurasia.<sup>118</sup> This project collects heritage data produced over many decades in laboratories across Eurasia on materials from many sites with varying levels of accuracy both in associated dates and archaeometallurgical data resolution.<sup>119</sup> It thus faces the issue of varying levels of accuracy and precision in measurements but also the broader issue of how to connect theorists, lab-based scientists, and archaeologists working in various parts of the world. For big-picture narratives, the need to work with large amounts of data furthermore raises the issue of how to record and connect these various strands of evidence. One solution is a pragmatic approach of database development using CIDOC-CRM,<sup>120</sup> an international standard for cultural heritage information.<sup>121</sup> It is an object-oriented conceptual reference model, whose upper ontology covers the core classes of space-time, events, material and immaterial things, connecting various types of scientific and archaeological data and allowing for a wide variety of queries. The FLAME project database is taking this approach. Within the CIDOC-CRM framework, FLAME decided to focus on matters of biography, agency, value, and identity, considering communication, exchange, networks, movements and flow of various types.

Another framework developed within the FLAME project combines the object-oriented approach suitable to archaeological work with prosopography via the concept of object biographies.<sup>122</sup>

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<sup>117</sup> Hein, Anke. "The Problem of Typology in Chinese Archaeology." *Early China*, no. 39 (2016): 21-52; Hein, Anke. "Keramik = Kultur? – Das Problem Der Kulturdefinition in Der Euroamerikanischen Und Der Chinesischen Archäologie." In *Vom Wesen Der Dinge – Realitäten Und Konzeptionen Des Materiellen in Der Chinesischen Kultur*, edited by Grete Schönbeck and Phillip Grimberg, 33-56. Wiesbaden: Harassowitz, 2019.

<sup>118</sup> Liu, Ruiliang, A. Mark Pollard, Jessica Rawson, Xiaojia Tang, Peter Bray, and Changping Zhang. "Panlongcheng, Zhengzhou and the Movement of Metal in Early Bronze Age China." *Journal of World Prehistory* 32, no. 4 (2019/12/01 2019): 393-428; Pollard, A. M., P. Bray, P. Hommel, Y. K. Hsu, R. Liu, and J. Rawson. "Bronze Age Metal Circulation in China." *Antiquity* 91, no. 357 (2017): 674-87; Radivojevic, M., M. Martinon-Torres, J. Mei, C. Broodbank, B. W. Roberts, E. Pernicka, Z. Stos-Gale, et al. "The Provenance, Use, and Circulation of Metals in the European Bronze Age: The State of Debate." *Journal of Archaeological Research* (2018): 1-55.

<sup>119</sup> The project focuses on "the movement, exchange, and transformation in Eurasian societies during the Bronze and Early Iron Age" (FLAME: Flow of Ancient Metal Across Eurasia. <http://flame.arch.ox.ac.uk/>, 2018).

<sup>120</sup> The acronym stands for Comité international pour la documentation – Conceptual Reference Model.

<sup>121</sup> Crofts, Nick, Martin Doerr, Tony Gill, Stephen Stead, and Matthew Stiff. "Definition of the CIDOC Conceptual Reference Model. Produced by the ICOM/CIDOC Documentation Standards Group, Continued by the CIDOC-CRM Special Interest Group, Version 5.0.4." ICOM/CIDOC CRM Special Interest Group, [http://www.cidoc-crm.org/sites/default/files/cidoc\\_crm\\_version\\_5.0.4.pdf](http://www.cidoc-crm.org/sites/default/files/cidoc_crm_version_5.0.4.pdf).

<sup>122</sup> Bray, Peter. "Biography, Prosopography and the Density of Scientific Data: Some Arguments from the Metallurgy of Early Bronze Age Britain and Ireland." In *Metals, Minds and Mobility: Integrating Scientific Data with*

Prosopography is a method developed in historical studies within a Digital Humanities framework to reconstruct patterns of activities by combining small pieces of individual information to assemble statistically significant amounts of biographical data that can then be evaluated together.<sup>123</sup> Considering that this field has grown from a desire to make humanities more scientific, collaborative, and interdisciplinary, it is a good sign that developments in Digital Humanities now serve as an inspiration for scholars in archaeological sciences. This engenders hope that truly interdisciplinary work is possible, promising, and attractive to the sciences, social sciences, and humanities alike.

The need to be multi-disciplinary naturally extends beyond connecting archaeology and archaeological sciences. In terms of research on culture contact and identity, in many parts of the world and for many periods this obviously concerns the integration of textual and material evidence. The main solution here has been to analyze various types of evidence separately but within agreed clear theoretical frameworks and models that are then used to draw the different strands of evidence together for a joint conclusion. This has been exemplified recently by Satomi Hiyama drawing together evidence from textiles, murals, texts, technological and geographic/environmental considerations, and analyzing them using methods from art history, history, and archaeology to throw light on cultural contact in medieval Kutch.<sup>124</sup> Likewise, several recent papers on human movement in the border lands of early imperial China have used any combination of textual, isotope, linguistic, and various types of archaeological and scientific data, not only to reconstruction migration routes and directions but also to investigate patterns and routes of exchange.<sup>125</sup> Particular points of interest in many of these studies are the influence of geography and the routes and push/pull factors in both patterns of movement and exchange networks. For late prehistoric Southeast Asia and Southern China, for instance, Higham and his colleagues emphasize the interplay between exchange of knowledge and material goods along long-established routes and local developments and engagements with the goods and ideas received as well as the people who carried them. They argue that all of these factors were furthermore connected with broader societal responses that differed based on local social structures and patterns of identity formation and expression. For instance, while in many parts of the world metal extraction and production was firmly in the hands of elites, enhancing their status and power, in Southeast Asia the advent of

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*Archaeological Theory* edited by Xosé-Lois Armanda, Mercedes Murillo-Barroso and Mike Charlton, 123-34. Oxford: Oxbow Books, 2018.

<sup>123</sup> Recent examples of prosopographic databases include Prosopography of Anglo-Saxon England (PASE, <http://www.pase.ac.uk/>) and Prosopography of the Byzantine World (PBW, <http://blog.pbw.cch.kcl.ac.uk>).

<sup>124</sup> Hiyama, Satomi. "Mural as a Text: 'Reading' the Buddhist Paintings of Kucha: Toward the Interdisciplinary Approach across the Art History and Philology." *Journal of World Buddhist Cultures* 世界仏教文化研究 1 (2017): 25-47, and "Untangling the Textiles in the Murals: A Study on the Monk's robes Depicted in the First Indo-Iranian Style Paintings of Kucha." *Journal of World Buddhist Cultures* 世界仏教文化研究 2 (2018): 59-94.

<sup>125</sup> Korolkov, Maxim, and Anke Hein. "State-Induced Migration and the Creation of State Spaces in Early Chinese Empires: Perspectives from Archaeology and History." *Journal of Chinese History* (2020): 1-23; Nelson, Sarah, Irina Zhushchikhovskaya, Tao Li, Mark Hudson, and Martine Robbeets. "Tracing Population Movements in Ancient East Asia through the Linguistics and Archaeology of Textile Production." *Evolutionary Human Sciences* 2 (2020): e5 e5; Wu, Xiaotong, Anke Hein, Xingxiang Zhang, Zhengyao Jin, Dong Wei, Fang Huang, and Xijie Yin. "Resettlement Strategies and Han Imperial Expansion into Southwest China: A Multimethod Approach to Colonialism and Migration." journal article. *Archaeological and Anthropological Sciences* 11, no. 12 (2019): 6751-81.

metallurgy did not lead to similar social developments.<sup>126</sup> These communities were connected to long-distance exchange networks, receiving goods, ideas, and people from sometimes far away, but metal production took place in village-based communities without any signs of individuals or small groups having special access to raw materials or final products or using them to express status. This thus is yet another examples that local perspectives are just as important to consider as the macro view of long-distance exchange.

In all discussions on contact and influence, however, the nature of networks – both physical and ideational – remain crucial. On the more abstract level, the idea of networks in the broad sense can be useful, especially when shifting the focus away from elite-level exchange of prestige goods to different forms of resources/assets and knowledge/know-how, ideally viewing them from an agency-driven perspective as for instance exemplified in several studies by Jessica Rawson discussing the relationship between the early Chinese states and the steppe.<sup>127</sup> Several recent studies on technological transfer, both across time and space, have highlighted the importance of continuing addressing macro, micro, and intermediate perspectives. At the same time, they show that research on technology in particular allows deeper insights into local practices and the nature of contacts rather than just establishing that contact took place. In the case of ceramic technology, for instance, it has been shown that knowhow was more widely circulated – or selectively withheld – and then partially adopted and adapted to local circumstances.<sup>128</sup> In the case of metallurgy, both raw material and final products were circulated over sometimes astonishing distances. Research trying to trace the supply networks of raw materials based on chemical analyses is continuing,<sup>129</sup> as is work aiming to reconstruct distribution networks of final products.<sup>130</sup> Many of these studies, however, use the term “network” in a rather loose way to refer to connections between the locales of raw material extraction, object production, and product consumption, without pondering the physical route between or the socio-economic or personal connections between the locales and people involved.

Routes of exchange and their geographical correlates continue being explored using GIS applications, though scholars are very aware of methodological issues of techniques such as least-

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<sup>126</sup> Higham, Charles F. W. "The Later Prehistory of Southeast Asia and Southern China: The Impact of Exchange, Farming and Metallurgy." *Asian Archaeology* (2021). <https://doi.org/10.1007/s41826-021-00040-y>.

<sup>127</sup> Rawson, Jessica. "Carnelian Beads, Animal Figures and Exotic Vessels: Traces of Contact between the Chinese States and Inner Asia, C. 1000-650 Bc." *Archäologie in China 1: Bridging Eurasia* (2010): 1-4; Rawson, Jessica. "China and the Steppe: Reception and Resistance." *Antiquity* 91, no. 356 (2017): 375-88.

<sup>128</sup> E.g. Heitz, Caroline, and Regine Stapfer, eds. *Mobility and Pottery Production Archaeological and Anthropological Perspectives*. Leiden: Sidestone Press, 2017; Lee, Hsiu-Ping. "Erlitou and Its Neighbors: Contextualizing Interregional Interaction in the Central Yellow River Region in Ancient China." PhD Dissertation, University of California, Los Angeles, 2018; Womack, Andrew. "Crafting Community, Exploring Identity and Interaction through Ceramics in Late Neolithic and Early Bronze Age Northwest China." PhD Dissertation, Yale University, 2017.

<sup>129</sup> Hsu, Yiu-Kang, Rebecca O'Sullivan, and Haichao Li. "Sources of Western Zhou Lead: A New Understanding of Chinese Bronze Age Supply Networks." *Archaeological and Anthropological Sciences* 13, no. 2 (2021): 30.

<sup>130</sup> Li, Haichao, Jianli Chen, Jianfeng Cui, Xiaohong Wu, Yingliang Yang, Fengchun Huang, and Tianjin Xu. "Production and Circulation of Bronzes among the Regional States in the Western Zhou Dynasty." *Journal of Archaeological Science* 121 (2020): 105191; Zhangsun, Y. Z., R. L. Liu, Z. Y. Jin, A. M. Pollard, X. Lu, P. J. Bray, A. C. Fan, and F. Huang. "Lead Isotope Analyses Revealed the Key Role of Chang'an in the Mirror Production and Distribution Network During the Han Dynasty." *Archaeometry* 59, no. 4 (Aug 2017): 685-713.

cost paths and visibility issues as well as the ephemeral nature of early road and trade networks.<sup>131</sup> To address this issue, some recent studies focus on the interplay between human and natural inputs on an everchanging landscape, emphasizing geographical constraints on mobility.<sup>132</sup> Others argue that focusing on natural features as constraints is misleading, as for instance in the case of the Alps, which – despite their high elevation and often difficult routes of transport – were apparently not a barrier to exchange of raw materials and ideas on metalworking.<sup>133</sup> Studies of mobility in the Northern Libyan desert have shown that routes of movement and interaction – rather than being entirely predetermined by geographic features – are shaped by “implicit knowledge, varying social practices, and economic drivers”, leading to complex patterns difficult to fully grasp via landscape-based spatial analysis alone.<sup>134</sup>

One way forward may be the combination of spatial analysis with network modeling as well as other sources of information such as ethnographic and textual accounts. Here as for many other methods and techniques requiring specialist knowledge, collaboration between archaeologists and experts in those techniques is the main if not the only avenue forward.<sup>135</sup> Conversely, archaeology also has something to offer to network scientists as network approaches need theoretical grounding.<sup>136</sup> This highly technical-mathematical approach thus fits particularly well with socio-political or even philosophical/psychological concepts such as phenomenology, agency, globalization/glocalization, and Appadurai’s five “scapes” of global cultural flow.<sup>137</sup>

Indeed, on the conceptual level issues of Globalization and Colonialism in particular continue being much discussed, the latter still mostly in connection with the Americas but recently also areas not discussed from that point of view before such as Roman Britain or China.<sup>138</sup> Particularly

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<sup>131</sup> Wordsworth, Paul D. "How to Trace Desert Connections – Methodological Approaches for Defining Ephemeral Trade Routes in Medieval Central Asia." *Culture Contacts in Ancient Worlds – Theories and Case Studies*, Oxford, 24-26 March, 2017.

<sup>132</sup> E.g. Citter, C., G. M. Amato, V. Di Natale, and A. Patacchini. "A Stratified Route Network in a Stratified Landscape. The Region of Enna (Central Sicily) from the Bronze Age to the 19 Th C. Ad." *Open Archaeology* 3, no. 1 (2017): 305-12.

<sup>133</sup> Perucchetti, L., P. Bray, A. M. Pollard, and A. Dolfini. "Physical Barriers, Cultural Connections: Prehistoric Metallurgy across the Alpine Region." *European Journal of Archaeology* 18, no. 4 (2015): 599-632.

<sup>134</sup> Rieger, Anna-Katharina. "The Various Ways of Being Mobile: Habitual Knowledge, Life-Strategies and the Ancient Route Networks on the Eastern Marmarica- Plateau (Northern Libyan Desert)." *Open Archaeology* 3, no. 1. (2017): 49-68.

<sup>135</sup> See for instance Brughmans, Tom, Anna Collar, and Fiona Susan Coward, eds. *The Connected Past : Challenges to Network Studies in Archaeology and History*. Oxford: Oxford University Press, 2016; various examples in Kristiansen, Kristian, Thomas Lindkvist, and Janken Myrdal, eds. *Trade and Civilisation : Economic Networks and Cultural Ties, from Prehistory to the Early Modern Era*. Cambridge: Cambridge University Press, 2018; Light, Ryan, James Moody, and Carl Knappett. "Networks in Archaeology." In *The Oxford Handbook of Social Networks*. Oxford Handbooks Series: Oxford University Press, 2021.

<sup>136</sup> See e.g. Knappett, Carl. "Globalization, Connectivities and Networks: An Archaeological Perspective." In *The Routledge Handbook of Archaeology and Globalization*, edited by T. Hodos. New York: Routledge, 2017.

<sup>137</sup> Appadurai, Arjun. "Disjuncture and Difference in the Global Cultural Economy." *Theory Culture Society* 7, no. 2-3 (1990): 295-310.

<sup>138</sup> Campbell, Louisa. "Culture Contact and the Maintenance of Cultural Identity in Roman Scotland." In *Roots of Nationhood: The Archaeology and History of Scotland*, edited by Louisa Campbell, Dene Wright and Nicola E. Hall, 75-75. Oxford: Archaeopress, 2018; Hofman, Corinne L., and Floris W. M. Keehnen, eds. *Material Encounters and Indigenous Transformations in the Early Colonial Americas: Archaeological Case Studies*. Leiden: Brill, 2019;

remarkable are recent publications that practice or at least call for giving indigenous communities a voice in the exploration of their (pre-)histories<sup>139</sup> and/or returning material culture forcibly removed by colonial powers.<sup>140</sup> They draw attention to power asymmetries in the present (some of them with long histories) that determine who tells (pre-)histories, and try and find ways to provide new and more balanced views of colonial encounters. Applying a postcolonial theoretical perspective to regions that have previously not been seen from this point of view has also been shown to provide new insights into identity formation in connection with territorial expansions of early states. Work by Jaffe and colleagues, for instance, has provided a nuanced view of Western Zhou expansion in early China, highlighting the variation in incorporation strategies of local culture, as seen for instance in how Zhou type food vessels were adapted to local food practices in ways that helped maintain local identities.<sup>141</sup> Employing globalization concepts, they furthermore argue that inter-regional interaction networks were already in existence long before the Zhou conquest. This constant influx of outside ideas and objects lead to the development of locally specific ways of incorporating outside input, mechanisms that continued to be employed also toward the colonial power of the Zhou. Cases like this highlight the diversity reactions to novel elements that may lead to diversification rather than the homogenization more commonly associated with Globalization in the modern world.

In addition to considering parts of the world not dominated by European traditions (be it in Europe itself or in regions influenced by European colonial forces), another welcome trend in recent years has been to consider “people without history”, who are often disregarded in both historical and archaeological research. For instance, a recent edited volume by Boivin and Frachetti on Globalization focuses specifically on groups living outside the urban centers of major civilizations and their role in long-distance “flows of knowledge, technology, people and things long before the era of European colonization, and well after its onset.”<sup>142</sup> They agree with Pieterse’s criticism that perceived European distinctiveness has prevented scholars from acknowledging the role of others in processes of globalization.<sup>143</sup> The volume thus contains contributions from a wide range of places across the globe, some spanning areas as large as the whole of Eurasia, though most focus on medium-scale areas such as the Syrian Desert or Island Southeast Asia. Broadly speaking, the

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Mirrington, Alexander D. *Transformations of Identity and Society in Anglo-Saxon Essex: A Case Study of an Early Medieval North Atlantic Community*. Amsterdam: Amsterdam University Press, 2019; Waal, Maaïke de, Niall Finneran, Matthew Reilly, Douglas V. Armstrong, and Kevin Farmer. *Pre-Colonial and Post-Contact Archaeology in Barbados: Past, Present, and Future Research Directions*. Leiden: Sidestone Press, 2019.

<sup>139</sup> Acabado, Stephen, and Marlon Martin. "Decolonizing the Past, Empowering the Future: Community-Led Heritage Conservation in Ifugao, Philippines." *Journal of Community Archaeology & Heritage* 7, no. 3 (2020): 171-86; Gould, Peter G. *Empowering Communities through Archaeology and Heritage: The Role of Local Governance in Economic Development*. London: Bloomsbury Academic, 2019.

<sup>140</sup> Hicks, Dan. *The Brutish Museums: The Benin Bronzes, Colonial Violence and Cultural Restitution*. London: Pluto Press, 2020.

<sup>141</sup> Jaffe, Yitzchak. "Colonialism in the Time of Globalization – the Western Zhou Yan State Revisited." In *The Routledge Handbook of Archaeology and Globalization*, edited by Tamar Hodos, 438-53. London: Routledge, 2017; Jaffe, Yitzchak, Qiaowei Wei, and Yichao Zhao. "Foodways and the Archaeology of Colonial Contact: Rethinking the Western Zhou Expansion in Shandong." *American Anthropologist* 120, no. 1 (2018): 55-71.

<sup>142</sup> Boivin, Nicole, and Michael D. Frachetti. *Globalization in Prehistory: Contact, Exchange, and the 'People without History'*. Cambridge: Cambridge University Press, 2018, p. 2.

<sup>143</sup> Pieterse, Jan Nederveen. "Oriental Globalization: Past and Present." In *Europe and Asia Beyond East and West*, edited by Gerard Delanty, 61-75. London: Routledge, 2006.

contributions all argue for a long chronology and highly diverse model of globalization that involves a large number of networks and discontinuous processes in which agents in regions traditionally thought of as peripheral play a major role. However, the contributors have different views of how to use the concept of globalization in archaeological research. Some see it merely as a heuristic device to refocus debates on long-distance interactions,<sup>144</sup> others argue for its usefulness in providing a way to discuss the process of increasing cross-regional connectivity in a systematic fashion,<sup>145</sup> and others again combine globalization with other concepts such as hybridity and glocalization,<sup>146</sup> or explore ways to distinguish between the modern globalized world and earlier “globalizing interactions.”<sup>147</sup> All, however, take a healthy step away from elite- and text-centered perspectives and Western-world focused narratives. Furthermore, the volume highlights the critical role that archaeology with its material focus can have not only in considering the contribution of groups who did not leave textual accounts but also aspects of exchange not easily found in historical sources. For instance, technologies play a major role in many of the papers, as do styles (and to a lesser extent mortuary customs) and their importance in identity formation and expression. This chimes in closely with recent debates on the interplay of multiple identities, be they geographically and/or socio-culturally defined, as well as the influence of individual, situational, and location-based choices which are best identified by combining several sources of evidence and a variety of methods such as spatial analysis, style, textual analysis, technological considerations, geographic and environmental background.<sup>148</sup>

## Remaining Questions and Future Research

As the broad overview presented here has shown, much progress has been made toward a more complex, multi-voiced understanding of inter-regional, inter-group, and inter-individual interactions on various levels. The complexity of the issue has made it clear that one approach or even one field of study alone would be hard-pressed to provide a suitably nuanced view. Instead, what is needed are multi-method, multi-source, interdisciplinary collaboration combined with a

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<sup>144</sup> Hommel, Peter. "What's the Point?: Globalization and the Emergence of Ceramic-Using Hunter-Gatherers in Northern Eurasia." In *Globalization in Prehistory: Contact, Exchange, and the 'People without History'*, edited by Michael D. Frachetti and Nicole Boivin, 15-42. Cambridge: Cambridge University Press, 2018.

<sup>145</sup> Frachetti, Michael D., and Elissa Bullion. "Bronze Age Participation in a “Global” Ecumene: Mortuary Practice and Ideology across Inner Asia." In *Globalization in Prehistory: Contact, Exchange, and the 'People without History'*, edited by Michael D. Frachetti and Nicole Boivin, 102-30. Cambridge: Cambridge University Press, 2018.

<sup>146</sup> Frachetti and Bullion, “Bronze Age Participation”; Jaffe, Yitzchak, and Rowan Flad. "Prehistoric Globalizing Processes in the Tao River Valley, Gansu, China?." In *Globalization in Prehistory: Contact, Exchange, and the 'People without History'*, edited by Michael D. Frachetti and Nicole Boivin, 131-61. Cambridge: Cambridge University Press, 2018.

<sup>147</sup> Carter, Robert. "Globalising Interactions in the Arabian Neolithic and the 'Ubaid.'" In *Globalization in Prehistory: Contact, Exchange, and the 'People without History'*, edited by Michael D. Frachetti and Nicole Boivin, 43-79. Cambridge: Cambridge University Press, 2018.

<sup>148</sup> E.g., Hiyama, Satomi. "Mural as a Text: ‘Reading’ the Buddhist Paintings of Kucha: Toward the Interdisciplinary Approach across the Art History and Philology." *Journal of World Buddhist Cultures* 世界仏教文化研究 1 (2017): 25-47, and "Untangling the Textiles in the Murals: A Study on the Monk’s robes Depicted in the First Indo-Iranian Style Paintings of Kucha." *Journal of World Buddhist Cultures* 世界仏教文化研究 2 (2018): 59-94; Zamboni, Lorenzo, M. Fernández-Götz, and C. Metzner-Nebelsick, eds. *Crossing the Alps Early Urbanism between Northern Italy and Central Europe (900-400 Bc)*. Leiden: Sidestone Press, 2020.

consideration for a wide variety of behavioral patterns and complex interplay of various actors and intentions. Such multi- and inter-disciplinary research needs a shared terminology. Concepts have to be carefully chosen and defined for every project and publication. Not even “culture contact” can be defined in a universal way, and it might not even be the most suitable umbrella term, given that it is all too often applied as a blanket explanation for similarities between different regions and phenomena or the appearance of foreign goods in far-away places. Indeed, culture concepts are still a major problem for archaeological research, especially in large-scale narratives where for purposes of simplification material culture, technology, subsistence patterns, language, genetics, and ethnic/cultural identity are treated as neat packages moving together from place to place in migratory movements or waves of influence. As many recent publications have highlighted, also other essentialist terms such as “steppe culture” or “steppe people” or dichotomies such as “colonizers” vs “colonized” or “nomads” vs “settled agriculturalists” are dangerously misleading.<sup>149</sup>

However, as has become clear above, culture concepts – as well as issues of contact – are essential to archaeological research, and archaeological culture names as short-hand references to recurring associations between specific types of material culture in specific locations during a specific time are unlikely to go away. Furthermore, as has become clear above avoiding discussing culture concepts and using archaeological culture names as mere labels for groups of data is rather dangerous as it fosters misunderstandings about their relationship to past identity groups reflected in other types of data. It is therefore crucial for archaeologists to be explicit about and explain clearly to collaborators from other fields what archaeological cultures are, namely artificial units created as tools of archaeological research reflecting shared behavioral patterns reflected in material remains but not equivalent to linguistic or ethnic groups identifiable through historical texts or DNA research. Indeed, in studies combining material remains, textual evidence, and/or various types of scientific genetic, it is shown clearly that there are different types of identities at play that do not form one neat unit. Rather, multiple and even contradictory identities can be manipulated and expressed in various media, making it all the more crucial to combine multiple strands of evidence in a conceptually nuanced multi-method collaboration bridging archaeology, history, and the sciences.

Given this complexity, as shown in many successful studies mentioned above, localized studies can indeed focus on complex matrixed of interaction between communities and even individuals, discussing mechanisms of adoption, adaptation, misunderstandings, and mediations, painting a nuanced picture of small-scale developments and actions. While furnishing great results on a small scale, such an approach can make it difficult to apply to larger amounts of data, making it difficult to tell medium-scale, let alone big-picture stories covering large areas and long-term developments. For dealing with large amounts of data at varying resolution, working with data scientists and network models has been shown to be particularly fruitful as they can address processes taking

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<sup>149</sup> E.g. Brosseder and Miller, “Global Networks”; Ventresca Miller, Alicia R., and Cheryl A. Makarewicz. "Intensification in Pastoralist Cereal Use Coincides with the Expansion of Trans-Regional Networks in the Eurasian Steppe." *Scientific Reports* 9, no. 1 (2019): 8363; Taylor, William Timothy Treal, Julia Clark, Jamsranjav Bayarsaikhan, Tumurbaatar Tuvshinjargal, Jessica Thompson Jobe, William Fitzhugh, Richard Kortum, *et al.* "Early Pastoral Economies and Herding Transitions in Eastern Eurasia." *Scientific Reports* 10, no. 1 (2020). <https://doi.org/10.1038/s41598-020-57735-y>.

place at various levels. Indeed, as shown above, large-scale multi-disciplinary projects involving large databases have become more common over the last decade, though the issue remains that network analysis (and many other approaches) require precisely defined units and clear chronologies, something that archaeology cannot always provide. This is an issue not easily resolved and indeed often overlooked in big-picture narratives based on large amounts of data that is naturally uneven in resolution and quality.

One field of inquiry where such issues have been addressed quite successfully are studies on technology, an area of interest for historians, archaeologists, and scientists alike. Technological processes and developments are furthermore connected to issues of economy and administration/organization that are of great concern to historians and also many archaeologists. Unfortunately, as pointed out above, in research on metallurgy as well as early domesticates and various types of isotope studies, there is at times a disconnect between archaeological sciences providing large amounts of precise composition data for various kinds of materials to paint large-scale narratives, but sticking with simple models of exchange and influence and an increasingly more sophisticated theoretical debate whose complex terminology can be difficult to connect with numerical data. Here, moving between different scales of analysis and analyzing different types of data separately before coming to joint conclusions based on shared conceptual frameworks seems to be a particularly promising way forward. Indeed, as highlighted above, recent interdisciplinary research has shown that for the adoption of new technologies and domesticates alike, socio-cultural factors can be more or at least as important as concerns of climate, environment, resource availability, or other practical concerns.

Likewise, the insight that it is often small groups and individuals in marginal areas rather than elites in political cores dominating historical accounts (and much of the archaeological attention), has greatly advanced our understanding of processes of interaction and technological transfer and development. Indeed, examples such as these show clearly some of the benefits of considering archaeological data both in cores with more or less abundant textual accounts and so-called “peripheries”, as they help give a voice to “people without history” in both types of locations. At the same time, including textual accounts is just as important as they provide the “elite” view and political and organizational information as well as conceptual and ideational aspects that are difficult if not impossible to extract from material remains. The hard sciences additionally help with considering affordances and giving agency to non-human actors, including objects, animals, even plants, geology, and the whole natural environment, elements which can be successfully integrated in network models that allow for analyses at macro, micro, and intermediate scales, considering both ideational and spatial correlates.

Particularly encouraging in this context is the recent trend to consider areas outside the Euro-American sphere of influence, trying to counteract the Western cultural bias especially in discussions on Globalization and Colonialism, and giving indigenous communities a voice in exploring their past, while at the same time raising uncomfortable issues of Eurocentrism, racism, and colonial appropriation of lands, objects, and histories. In this enterprise, combining evidence and approaches from history, archaeology, and the sciences, integrating them via concepts such as agency, network thinking, and human/material/nature interaction, is a particularly promising avenue toward a more in-depth, multi-scalar, and multi-voiced understanding of the human and non-human past.