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Archaeology and Innovation: Remarks on Approaches and Concepts

Summary

This introduction to a set of papers on innovations in ancient societies discusses an overview of crucial issues raised in the collected contributions. It is evident that the esteem for innovations in different societies was highly uneven. Most of the contributions collected here argue that in non-modern circumstances, innovations had to be inserted into existing cultural traditions with utmost care to be successful.

Keywords: Archaeology; innovation; entrapment; technology; Actor-Network Theory.

Diese Einleitung zu Innovationen in vormodernen Gesellschaften gibt eine Übersicht über die grundsätzlichen Fragen, die in den folgenden Einzelbeiträgen angesprochen werden. Deutlich wird, dass die Bewertung von Innovationen in unterschiedlichen Kulturen stark variierte. Die meisten der hier versammelten Artikel deuten darauf hin, dass Innovationen in nicht-modernen Gesellschaftszusammenhängen nur dann erfolgreich waren, wenn sie mit großer Sorgfalt in existierende kulturelle Traditionen eingeschrieben wurden.

Keywords: Archäologie; Innovation; Verstrickung; Technologie; Akteur-Netzwerk Theorie.

In archaeology, innovations have traditionally been treated as a part of a development process in which smaller or larger bundles of technological and other inventions have changed entire cultural and social entities. V. G. Childe's conceptualization of human history as marked by a Neolithic, an Urban and an Industrial Revolution is a paradigmatic example of this concept. Over time, further research has led to the recognition that Childe's historic 'revolutions' were complex, regionally specific processes rather than broad innovations with an almost global reach. Still, most research on innovation in archaeology focuses on the presumed functional advantages that lead to the widespread adoption of new technologies. However, even successful innovations are located in a network of pre-existing lifeworlds and have a wide, often unrecognized impact on social structures and cultural practices. In research on innovation, it is imperative to focus not just on the intended consequences of technological changes, but also on the unintended ones. While the former are mainly conceptualized as 'enabling' effects for social actors, an over-emphasis on them misses the full range of the consequences of innovations that Michael Schiffer has appropriately called a "cascading" process.[1] Beyond these enabling factors, the complex web in which innovations are situated also contains elements that constrain social practices, or that produce new ones that on the surface appear to be separate from the innovations themselves. Our primary goal with this collection of essays is to investigate these complex entanglements of innovations in past cultural-social worlds.

Wolfgang Schivelbusch's book *The Railway Journey* is a brilliant case study of the entanglement of innovations, albeit from recent history. He shows that the development of trains was not just an important step in industrial technological development, but also affected perceptions of time, led to the appearance of new literary forms, the recognition of psychic trauma as a disease, among a myriad of other consequences. Our book, based on a conference in Berlin and supported by the Excellence Cluster Topoi, explores the often unrecognized preconditions and particularly the consequences of innovations in the realm of archaeology. These may be functional, cultural, purely aesthetic, or practical.

One crucial issue for archaeologists that Schivelbusch did not need to consider is ontological difference between the researchers' and the researched world. The lifeworld of 19th century train travelers was substantially different from our own, but basic ideological underpinnings were similar. Archaeological investigations of innovations, however, must always face the likelihood or at least the possibility that we are dealing with a world in which actors/agents were conceptualized radically differently than we do today. A consequence may be that 'innovation', a term that for us is firmly anchored in a materialist worldview, may not be seen as positively as it is in the realm of Western

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1 Schiffer 2005.

academic disciplines, such as archaeology. The import of this issue comes through in some of the papers in this volume: the 'new' is not necessarily perceived as desirable in all cultures and societies, and in specific cases, an introduction of new items or technologies may be prevented by taboos (see contribution by de Silva and Jung). Ontological difference can play a significant role when the researchers' worldview completely objectifies non-human beings and things, as is the case in our modern science and economy-based world, whereas they may be understood as 'sentient beings' in many non-capitalist worlds. The changing relation between humans and animals in the course of neolithization is a case of ontological change itself. The adoption of lifeways that are strongly intertwined with herd animals is not necessarily best conceptualized as the appearance of 'management strategies', and draught animals may be more than a 'living motor' for a plow or a cart. A recognition of ontological difference, recently discussed intensely in anthropology, forces us to think in terms of symbioses in which specific animals may not even be conceived of as substantially different from human beings (see contributions by Dittrich and Reinhold).[2]

Can the recent development of *Science and Technology Studies,* and in particular of Actor-Network Theory (ANT), lead us out of the trap of universalizing enlightenment values and their associated ontology, out of the narrow modernist dichotomy of subjects and objects, and a world that consists of active humans and passive things? ANT and related paradigms dissolve a 'user' (human) versus 'used' (world) distinction. These categories are considered to be no longer suitable for an analysis of technical processes. In ANT, humans and things blur into a complex technological entity capable of acting. In Latour's vocabulary, they form collectives, hybrids, assemblages, networks, and actants. Things and techniques become actors in their own right, on a par with humans. In this sense, an actor is an entity that has been considered by someone/something else to act.[3] This concept is free of the intentionality, competence and skill that are fundamental elements for traditional worldviews, which presuppose the existence of knowledgeable human users in the case of any technology. Latour separates action from a rational, autonomous subject; it is no longer the prerogative of thinking beings. With this basic shift ANT attempts to dissolve the very foundations of a traditional sociology of technology. In our set of papers, it is mainly Burmeister who comes close to such an approach.

But can a technological collective be reduced to a web of social relationships connecting people and things? This would neglect the specific functional connections of technologies, namely the "technical schemas" addressed in Gilbert Simondon's theory of machines.[4] These schemas are rooted in self-referencing characteristics of technology,

2 Descola 2013; Viveiros de Castro 2004; for archaeology see Watts 2013.

3 Latour 2005, 70–74.

4 Simondon 2012 [1958].

not in a common social background of devices and humans. The importance of Simondon's ideas lies in his insistence on the internal logic of things and techniques. This can be expressed in the notions of *affordance* – put simply: their enabling characteristics – and *Eigensinn* or 'obstinacy', those properties that limit the variability of their use and restrict the potential to integrate them into compounds of beings/things. It is precisely this relationship between affordances and *Eigensinn* as part of an internal logic of things that can be responsible for innovation processes as well as obstructions to their course (see contributions by Burmeister and Hahn).

But affordance and *Eigensinn* are also at the origin of power relations between complex things and humans. These power relations run counter to Latour's claim of an even distribution of power in thing-human hybrids. Günther Anders maintains that human beings display a tragic "Promethean shame" in their desperate and incompetent bid to mimic perfected machines that they themselves developed in wave after wave of innovations: things have taken over the lead, and our power over the technological world is a mere phantasm.[5] In Anders' sense, one could say that Latour's ANT provides the ideological background for a technology-driven world. The interests of technology and innovation need to be taken seriously, and Latour's stance turns these interests into universal ones, although they are in fact particular. In this connection, it is important to acknowledge that archaeological studies of innovation run the risk of providing a firm (pre-)historical foundation for a highly specific relation between humans and technologies they created. The representation of innovations as the emergence of new and historically relevant human-thing relations de-historicizes these changes by turning the advent of the exceptional (the brand new) into normality. The result is the familiar story of progress in human (de facto, European) history. Despite all the criticism of civilization and culture, so the background idea goes, who would want to exchange their conditions of life and the associated comforts for those of a Neolithic society and its (rudimentary) technologies? Even if the promise of capitalism increasingly inverts itself into a dystopia, we still side with the more or less outspoken hope that present problems induced by a technological world of atomic bombs and other massive threats will be solved in the medium to long-term by the same means that brought us to our catastrophic global state: technological change.

This fundamental belief deeply influences our understandings of prehistoric societies and their innovations. We think that we know from historical as well as our own experience what things are made for. We assess the cultural significance of sedentary lifestyle, metallurgy or wheeled vehicles, for example, in a retrospective fashion and construct naively their 'obvious' benefits, whereas innovations of that sort were open-ended changes that could have borne connotations that extended from existential threat

5 Anders 1956.

to alluring attraction. Our functionalist perspective, turned into a narrative of progress, provides cultural and historical explanations that fit seamlessly into the genesis of our own world. Such a mindset overlooks the fact that innovations represent not only a gain, but also usually loss: new technologies lead to the abandonment of old ones and an erosion of associated embodied skills. In her contribution, Sabine Reinhold describes the innovation of standardized architecture as limiting the variability of possible practices and therefore as limiting innovations; Florian Klimscha notes the decrease in types and technological variability in the production of lithic tools with the advent of (functionally underperforming) copper axes; Susan Pollock mentions the loss of interest and skills in decorating vessels that came about with the advent of the fast potter's wheel; most papers in this volume refer to similar effects. To take an example closer to the present: crafting skills are on the decline since the age of industrialization, and sensory skills follow suit in the age of computers. We have almost entirely lost the capacity to read the signs of 'nature', i.e. to recognize traces and relations of animals and plants in forests; instead, we refer to scientific knowledge from books or websites. More and more, practical competence is delegated to machines at the cost of our own competence – one has just to think of the use of navigation systems in cars and the accompanying loss of one's own orientation. These 'success stories' are also always stories of loss.

Many contributors to this volume argue that in non-modern, pre-capitalist societies, relations between technology and human beings had a different outlook than today. People neither aspired to become impeccable copies of technological items, nor did they conceptualize the world from the point of view of subjects who are clearly set apart from objects that serve human desires. Rather, many, if not most innovations, whether functional, symbolic, practical or other, had to be inserted carefully into pre-existing social and cultural relations so as not to upset traditional lifeworlds. Only in recent history may the new be so desirable that its contrast with older things transforms the latter into shameful reminders of antiquated, obsolete worlds. Hans-Peter Hahn, whose contribution illuminates these oppositions, also claims that the habitus of a strict conceptual separation of an older material culture from items unequivocally identifiable as 'new' is at the core of consumerist mentalities. The strong distinction between old and new together with the high value placed on the latter induces us moderns to actively seek out innovations and abandon used items – epistemologies included! The stunning pace of changing paradigms in archaeology, from Latour's ANT to object-oriented ontologies and a 'multiple-ontologies' approach illustrates this well. Who would still cling to a constructivist paradigm in present circumstances, an epistemology that came to dominate archaeological discourse after many years of dispute (but see Bernbeck, this volume)? If archaeological studies of innovation remain strangely immune to the sirens of constructivism, this might also be due to the very theme of innovation and the skepticism

evinced in many studies of technology towards a way of thinking that emphasizes the power of language.

However, even in our times, discourses rely on patterns of familiarity and recognition. Nowadays, the word 'ontology' has become a sign denoting a specific outlook on the discipline of archaeology, even though it is used loosely and often carelessly. It has become a marker of the cutting edge, but it is in no way an entirely new concept itself. In his conference contribution (not included here), Gerd Graßhoff showed the great extent to which new techniques in modern laboratory research rely on well-known older ones. The new is only partially new. Important for any innovation is the extent to which new procedures or technical objects can be derived from already existing ones. But even if an innovation confronts its users with completely new ways of acting, it must have the potential to be inserted in a pre-existing horizon of experiences. This leads away from the technical, internal logic of the new to its cultural context and to social practices in which innovations are always embedded, and which they themselves help to shape.

In general, a successful innovation has as a prerequisite an integration into existing practical routines and structures of meaning, even if any innovation also leads at least in part to a disruption. This distinguishes the genuinely innovative from simple historical change. But the tendency to isolate the disruptive/new elements in archaeological and other studies of innovation produces a one-sided unrealistic account of the superceding of older traditions. Innovation is a process of cultural negotiation with many parameters, most of which are related to continuity and particularly with the insertion of the new into existing routines, techniques and ways of thinking. In our collection of papers, Klimscha maintains that Levantine copper axes were an innovation of the Chalcolithic age, albeit a dysfunctional one (they were less efficient than the traditional stone axes). Their inclusion in a material assemblage was a mix of an old form made from a new material. Visually, the recognition of a shape was likely associated with surprising aesthetic properties of shininess. Klimscha claims that these axes had only symbolic value and could only 'succeed' because they were embedded in the dynamics of gift giving. It was this positioning of new objects in a ritualized circulation of gifts that had wide-ranging consequences for other objects. Constance von Rüden provides another example of a negotiated integration of the new into specific contexts. Aegean-style fresco paintings in Middle Bronze palaces in Syria depended on previous forms of Aegean cultural elements that introduced this set of cultural symbols to Syria in earlier times. Even the advent of writing in Mesopotamia was no *ex nihilo* invention but had a millennia-long history of precursors (Bernbeck). Not a break from tradition through innovations, but rather the integration of innovations into pre-existing traditions seems to have been a

crucial preoccupation in the past. As Schivelbusch shows so clearly, this process depends on patient negotiations that may produce their own unexpected consequences.[6]

The cases of innovation analyzed in this volume do not form a coherent set of phenomena. The papers variously take as their point of departure production technologies and their materializations, particularly metal (Meyer, Klimscha, de Silva and Jung), productive and other practices such as herding, moving, building, writing (Dittrich, Burmeister, Reinhold, Bernbeck), or abstract issues such as repetitiveness (Pollock) or an identity of "Aegeanness" (von Rüden). It is clear from such variability that the term innovation is not necessarily tied to technologies but ranges between attempts at solving a specific problem with new means and changes in whole lifeways. Nevertheless, we find a number of shared concerns in these contributions.

One of the most important issues relates to the question of whether the combination of an invention and its imitation forms the core of any innovation,[7] or whether imitation might not itself be the cause of innovations. The traditional view puts the new prior to imitative practices and leads to a search for the origin of changes in one specific place and moment in time. Most innovation modeling insists on this scheme and sets up stages leading from inventions to their acceptance and an ensuing spatial diffusion. In this collection, two papers problematize this sequence of invention and imitation. Dittrich invokes Gabriel Tarde's work, arguing that routines, understood as daily, repetitive imitations of practices lead to small-scale variations.[8] It is these variations that are at the origin of innovations, not some stunning one-time idea. Variation is an unintentional effect of routines, and many concurrent, interconnected variations may lead to major innovations such as the Neolithic 'revolution'. However, such variation-producing imitative processes themselves can undergo change. Pollock argues that we witness exactly that in 4th mill. BCE Mesopotamia. The inner workings of repetitiveness in many fields of practice change at approximately the same time, and this bundle of changes induces a streamlining in the sphere of production; variations in routinized daily practices decrease.[9] One might conclude from such a constellation that the rate of innovations would radically decrease. However, that is not the case; instead, a proliferation of new categories of things and institutions ensues, likely the unintended consequences of an innovation on this meta-level of imitative practices. The old suspicion of 'more leisure – more creativity' (mentioned by Klimscha and first proposed by Robert Braidwood) seems to be a highly unlikely explanation for these connections. In her contribution, Reinhold claims that architecture changes communities substantially by anchoring relations between people and their material environment. But new buildings are more than

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6 Schivelbusch 2000.

7 Schiffer 2005.

8 Tarde 1903.

9 Latour foresees such a change in our times when he says that „it is up to us to change our ways of changing" (Latour 1993, 145).

technical dwellings. They change conditions of coexistence within a group by rigidifying its social fabric. Contrary to Pollock's case of an acceleration of innovations, Reinhold describes sedentarization as a serious impediment to innovations.

Several papers address the dynamics of innovations as long-term processes. It may not be particularly surprising to find such a pre-occupation in a set of archaeological papers, as archaeologists seem to be well-disposed to discover long-term trends and changes. But can innovations be the result of shifts in the long term? That would mean, in Marxist parlance, that such changes are not 'innovations for themselves', but only 'innovations in themselves'. They remained outside the consciousness and intentions of those who pursued them. Instances of innovation would not necessarily have been perceived as sudden breaks with older routines. However, these innovations were changes that could also not be easily inserted into existing cultural routines. They produced a kind of disruption that was minor, required cultural negotiation but did not pose insurmountable problems. Reinhold presents such a case when she argues that sedentarization and remaining in one location over long durations have far-reaching consequences that manifest themselves in full only with time: hygiene, waste management, a reorganization of domestic activities, new forms of intimacy because of tight spatial conditions, and other similar effects. But these outcomes should not be conceived as occurring simultaneously; problems appeared only slowly. Long-term innovations often are an *enchanement* of changes, not a specific event. The adoption of specific domesticates from southwest Asia was not necessarily a simple takeover of a whole package either (Dittrich), and the development of a documentary gaze was the cumulative effect of writing, then writing while moving, and finally of writing, moving and observing all at the same time (Bernbeck). This raises once again the question of what distinguishes routine cultural change from innovations. Must the aforementioned disruptions have been felt by those who integrated themselves into an innovation, or could it not have been disruptive only for those who remained on its edges – in Dittrich's case, those who continued a Mesolithic lifestyle beyond the advent of the Neolithic, in Bernbeck's, those who were the object of the documentary gaze? This question becomes more complex when we consider Michael Meyer's insistence on the singularity of rhythms in the development of iron smelting in different subregions of central Europe.

Several papers see innovations as strongly tied to communication and networks of communication. Hahn's discussion of the introduction of a new photocopy machine and its lack of success is a prototypical example of a lack of communication, a missing 'affiliative' relation between (new) things and people; it can also be read as an instance of a badly negotiated integration of the new into older practices and traditions. A look at the processes of 'appropriation' of material culture highlights a central problem in innovation research: the quasi-axiomatic assumption that a successful innovation results from

technological and economic advantages that obey purely instrumental reasoning.[10] New technologies develop rather against the background of a foregoing historically specific rationality that is part and parcel of each innovation process. Several contributions argue for an investigation of specific rationalities of those who deal with new technologies – or what traditional innovation literature would consider cultural 'irrationalities' that can come in conflict with the rationalities inherent in technical innovations. Innovations can fail because of a mismatch of contextual rationalities and technical instrumentality, for reasons that were less technical than social (Hahn, de Silva and Jung). The reasons for acceptance or rejection of new technological possibilities are related to the potential of people to build a relationship with technical objects. The creation of such affiliations, however, does not usually lie in the innovation itself. Various case studies in this volume (Hahn, de Silva and Jung, Dittrich) illustrate the precarious situation in which innovations may end. They have to prove themselves and are always in danger of being rejected. Affordances and the *Eigensinn* of new objects and techniques determine the longer-term development of processes of innovation.

The well-known case of the introduction of the steel axe among the Yir Yoront of Australia shows the ambivalence of innovations.[11] This case demonstrates that technical devices cannot be reduced to simple technical rationalities, but include often affordances of social agency. In Yir Yoront society, polished stone axes were traditionally a versatile and widespread tool employed in many activities. But even though all members of the group used them, their ownership was subject to the exclusive control of older men. Whoever needed an axe but did not have one, needed to borrow it, even for everyday tasks. And borrowing followed strict rules. The possession of an axe and the act of lending one were manifestations of the complex social fabric of the community, including relations between different age and gender groups. In addition, regional contacts were established and maintained through the transfer of these axes. This web of social dependencies and power relations was torn apart by the introduction of steel axes by a nearby missionary station. The missionaries distributed axes to women, children and young men who had previously been excluded from their possession. The new steel axes did not have real technical advantages over the old stone ones. Instead, they broke the tight social dependencies, as old men lost their social and political power that was tied to the distribution of stone axes. The dissolution of traditional patterns of gender and age roles eventually led to the collapse of the whole community. Contrary to general expectations, the historical and social impact of this innovation was not determined by its technological characteristics but by its social consequences, which – depending on one's perspective – can be seen as devastating (the elders) or as progressive (the missionaries).

10 Schreiber 2013.   11 Sharp 1952.

If these issues relate to the communication between people and things, communication also plays a different role in contexts of innovation. Klimscha and von Rüden present cases of pre-existing networks of human communication that are essential for the spread of new technologies of copper smelting and of *al fresco*-painting techniques, respectively. In the case of copper production, the network was not only a pre-condition for the spread of copper objects but was itself touched by the circulation of these new items and a tendency to include places of exchange related to raw material sources. Von Rüden's account presupposes maritime travel with a large, eastern Mediterranean network of interconnected ports. Burmeister's example is more complex. Wagons appear almost simultaneously over huge swaths of territory, from Mesopotamia to northern Europe. However, the synchrony of this change remains mysterious. In the case of the wagon, innovation concerns communication networks themselves as wheeled vehicles seem at first sight to have been their own medium of dissemination. However, this will hardly ever have been the case. The effect of this innovation is often overestimated, and the reason is a misunderstanding of the four-wheeled vehicles' limited ability to manoeuver. Their rigid front axle meant that they were hardly steerable.

A notion that shines through in some of the papers but would have merited more elaboration is entrapment as a result of innovations. Dittrich refers to threshing as one of the traps – more work – while Klimscha reminds us of severe health problems stemming from noxious fumes deriving from the smelting process. Bernbeck sees in the documentary gaze a matter of political control over the victims of this innovation. Pollock interprets the meta-innovation of repetitiveness in the Uruk period as a major entrapment for entire lifeways. These consequences of innovations can be intended, but are more often located in the realm of unintended consequences, referred to by Pauketat as the "tragedy of the commoners".[12] More in line with a discourse about innovation is Hodder's use of the terms "entanglement" and "entrapment" in his analysis of the long-term consequences of the relation between humans and things.[13] One can read Hodder's works as a pessimistic counter-discourse to Childe's progressivist *Man Makes Himself*.

The contributions in this collection abstain from a purely technical or object-centered perspective. Instead, they analyze innovations as part of socio-technical practices that result from already existing practices. As pointed out, innovations as disruptive changes are part of a process of cultural negotiation that can be, but are not always manifest in material culture. A purely technological perspective would restrict itself to surface phenomena and hide modifications in the routinized structural dynamics of a society. In our view, innovations are not just interventions that impose a renegotiation

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12 Pauketat 2000.

13 Hodder 2012.

of practices and meanings, but can also result in new distributions of resources. For instance, Meyer and de Silva and Jung expose the social components of metallurgy. They show that innovations in the field of metallurgy can result in a kind of democratization of essential resources, thus altering the very social fabric of a society. The Levantine and Mesopotamian examples (Klimscha, Pollock, Bernbeck) display the opposite effects, with a trend towards hierarchization and mounting inequalities. Both change and denial of access to resources may have been perceived in the past by those concerned as more crucial than the mere technological side of innovations.

The integration of new features into the cultural habitus of a community usually leads to new forms of routine. A cascade of further innovations is often the result. We remain usually unaware of the multiple connections that emerge out of innovations that we perceive as major changes in our lives. Our intent was originally to assess whether Schivelbusch's approach could be applied to archaeological innovations. His goal was to trace the far-reaching consequences of train travel as technological change, consequences that have less to do with the steam engine than with a technique of moving as a socio-cultural practice. Our accounts may look modest when compared to Schivelbusch's dense story of changing lives in the 19th century. But considering the knowledge that can be gained from archaeological sources, this may not be a surprise. We still hope that the resulting perspective leads to significant new insights.

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