

Archaeology and the future: Managing nuclear waste as a living heritage

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Archaeology is the study of the past and its remains in the present. It is relevant to the long-term preservation of records, knowledge and memory, e.g. regarding final repositories of nuclear waste, in two ways. Firstly, future archaeology may promise the recovery of lost information, knowledge and meaning of remains of the past. Secondly, present-day archaeology can offer lessons about how future societies will make sense of remains of the past.

Archaeology is always situated in a larger social and cultural context and the information, knowledge and meaning it generates is necessarily of its own present. Archaeological knowledge reflects contemporary perceptions of past and future; these perceptions change over time. Indeed, we cannot assume that in the future there will be any archaeology at all. We think, therefore, that future societies will want, and need, to make their own decisions about sites associated with nuclear waste, based on their own perceptions of past and future. To facilitate this process in the long term we need to engage each present, keeping safe options open.

In this text we elaborate on these issues from our perspective as archaeologists (see also Holtorf and Högberg, 2013; 2014a; 2014b; and forthcoming).

Has information, knowledge and meaning of the past been transmitted to the present?

Previous applications of archaeology to questions about the preservation of records, knowledge and memory have often attempted to draw lessons from what has been successfully preserved to the present day. For example, the Pyramids of Giza or the stone circle of Stonehenge are often mentioned as surviving monuments from the past containing ancient information and meaning for us to decode today (e.g. Kaplan and Adams, 1986).

From our perspective, however, we would be more cautious regarding the possibility of maintaining or recovering information, knowledge and meaning over long timespans. The example of European megalithic tombs shows how people's interpretations of their meanings and significance has changed drastically over the circa 5 000 years of their existence (Holtorf, 2000-2008). Indeed, many were completely destroyed. What was preserved or recovered was, at best, the assumption that these monuments stemmed from a distant past beyond human memory and that people may have been buried in them. But these assumptions hardly constitute the kind of maintenance or recovery of relatively complex information, knowledge and meaning that is relevant in the present context of nuclear waste repositories. The lesson to be learnt from this example is that information, knowledge and meaning are created in every present. Historical

development, including the history of interpretations, is not predictable and full of changes.

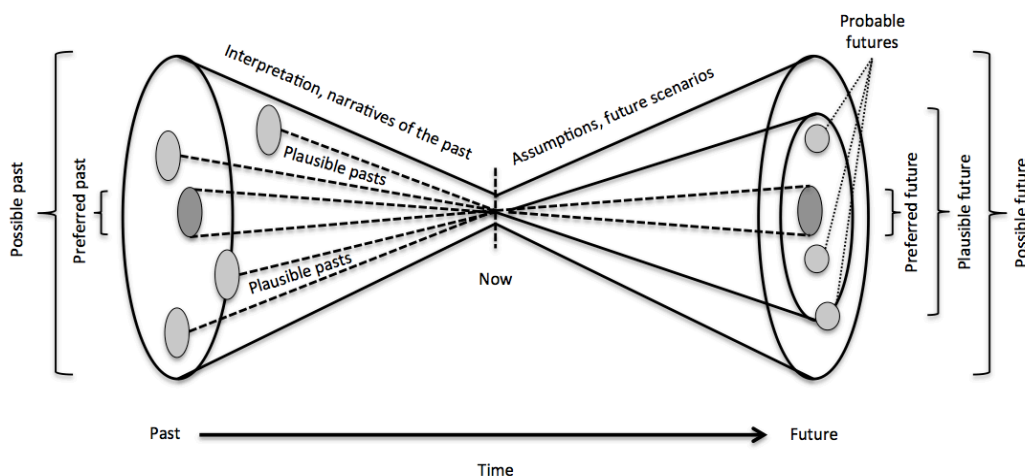
Like most scholarly disciplines, archaeology, as an academic discipline, is only about 150 years old, with roots maybe twice as old. In the long perspective it appears that archaeology does not look at its study objects such as megalithic tombs from a position that transcends history but it is instead itself part of history. Archaeology, like other academic disciplines of the present, is to be understood as situated in a larger social and cultural context. It is a particular way of creating information, knowledge and meaning of selected study objects in the present (Thomas, 2004). We cannot assume that current archaeological ways of making sense of the past will persist, nor that academic archaeology in the long-term future will even exist. Nor will most of the scientific disciplines as we know them today.

But archaeology can nevertheless offer valuable insights about the way in which future societies will make sense of remains of the past.

How will future societies make sense of remains of the past?

Archaeology is an important tool for understanding human and cultural development in time. The information, knowledge and meaning it generates is necessarily of its own present, reflecting that present's perceptions of both the past and the future. These perceptions are based on interpretations and narratives of the past and assumptions about the future. In Figure 9, we hypothesise on some of the processes involved when this takes place.

Figure 9: Schematic illustration of how interpretations of the past are transformed through the needle's eye of Now into assumptions of the future



Source: Anders Högberg, inspired by <http://adventurefuture.wordpress.com>.

Crucially, this is a “rolling now” constantly moving along the axis of time as the future becomes present and the present becomes past.

The way humans make sense of pasts and futures in the present is important for how we understand ourselves and our present time. We assume that this applies to all humans, past, present and future. Arguably, the ability to understand the present as a consequence of history and the way we plan for the future separates us from other species. Indeed, to think about time in complex abstract terms is unique to humans (Donald, 1991).

Society exists in the present, in its *Now*. Assumptions about different futures create different perceptions of the future in the present. The *preferred future* is what different stakeholders would like to happen and therefore varying among individuals and communities. The *probable futures* are what will likely happen. Since the probable futures are not one but many futures, it is likely that several stakeholders can agree on them. *Plausible* and *possible futures* are what could happen respectively of what might happen. These are not specific futures but rather theoretical possibilities deriving from certain detectable trends and movements in the present.

In analogy with the future, various interpretations about the past create different perceptions of the past in the present. Within the wide and almost infinite spectra of things which have taken place in the long-term history of *possible pasts*, a selection is made of *plausible pasts* and a *preferred past*.

The point to be made here is that these pasts all have to be processed in our present, the *Now* in Figure 9. As sand in a sandglass has to flow from one container into another through a narrow passage, time is constantly flowing through an ever changing present. And by passing through that narrow passage, the needle's eye comprising our present, the past is transformed into various assumptions about the future, i.e. future scenarios.

When we move the needle's eye of the *Now* along the timeline in Figure 9 back into the past or forward into the future, the shape of the figure will always stay the same. Every past and future present has specific limits and possibilities on how people understand their specific *Now* in relation to their interpretations of the past and their assumptions about the future.

We argue, therefore, that it is by understanding changing perceptions of past and future and indeed change over time more generally that archaeology allows us to make better decisions concerning the sustainable preservation of information, knowledge and meaning in a long-term perspective.

Implications for long-term preservation of records, knowledge and memory

Based on the previous argument we suggest that future societies will want, and need, to make their own decisions about sites associated with nuclear waste. They will, after all, have their own perceptions of past and future resulting in their own preferences in the *Now*.

To facilitate this process in the long term we need to engage continuously each present, keeping many options open provided they are safe. Consequently, we should not think too much about acting for the long-term, beyond keeping options open for future societies to make their own decisions and recognising that historical development is never predictable and full of unexpected changes. We can therefore say that a wise strategy is to think about the long-term but act for the short and medium terms. The best chance to have an impact on the long-term, is to keep knowledge alive in the short and medium terms (see also Holtorf and Högberg, forthcoming). Markers to inform future generations (such as the Waste Isolation Pilot Plant) are not wrong, but we must not put too much hope in them. We agree with NEA's integrated strategy of concurrent marking strategies that are directed at various short-term, medium-term and long-term futures.

Particularly important are forms of communication that will create contributions to contemporary life to keep knowledge about the sites alive (Pescatore and Mays, 2007). By that we mean to create appropriately themed forms of living heritage, i.e. traditions related to a particular theme that draw on the past and are constantly reinterpreted for the future. They can take many different forms, from specific designs (for example of markers) to skilful craft and from regular rituals (religious, seasonal, academic?) to continuing story-telling, all linked to the topic of nuclear waste and geological repositories. Over time, these specific contributions to contemporary life, like other heritage, will be reinterpreted, changed, supplemented and perhaps replaced in future

Nows. This type of communication is not limited to convey what we know and how we want somebody in the future to understand the sites or act upon them. Instead, we embrace fully that all futures will want, and need, to shape their own *Now* and thus make sense, and use, of final repositories of nuclear waste in their own way (Holtorf and Högberg, 2014a, 2014b).

In this approach, reinterpretation and indeed change of information, knowledge and meaning over time is not a problem to be eliminated as far as possible, but a basic condition of human development over time which we need to understand and take on board. We have to allow for future *Nows* to create their own knowledge to act upon. This way of looking at communication with the future does not focus on the fact that information and knowledge may be lost but builds instead on our knowledge of future human beings as creative and innovative creatures able to generate information, knowledge and meaning that we today cannot even imagine.

Conclusions

Archaeology is about the present and reflects present perceptions of the past and the future. Indeed archaeology as such is part of history; it emerged some 150 years ago and will not exist for all future. It is thus utopian to assume that in the long-term future there will be archaeologists able to recover lost information, knowledge and meaning from the clues we leave for them. Information, knowledge and meaning of the past cannot be transmitted reliably in the long term.

Even if the half-life of nuclear waste is long, we suggest here to focus mostly on the short and medium terms. Extending our previous argument about nuclear waste as cultural heritage of the future (Holtorf and Högberg, 2014a), we argue that the best way to communicate with the future is to create appropriately themed forms of living heritage in relevant communities.

It is unwise to try and pre-empt the future. We need to recognise that future societies will make their own decisions and that they will have their own views not only of the past but also of the future.

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