

Modern Climate Change and Contemporary Environmental Archaeology?

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Introduction

Almost two decades have passed since Paul Crutzen and Eugene Stoermer (2000) published their seminal article ‘The Anthropocene’, in which they argued powerfully for the need to define a new geological epoch marked by human domination of global geological and ecological dynamics. Since then, a large corpus of literature from supporters and critics, as well as from natural, social and human scientists has surfaced (see, for instance, Lewis and Maslin 2015 for a review of this debate). The idea of an Anthropocene epoch has received so much attention that it seems to be here to stay, if not as a recognized subdivision of geological timeframes, then as an analytical tool for framing interdisciplinary geo- and bio-cultural research strategies (cf. Riede et al. 2016c; Swanson 2016). Anthropogenic climate and environmental change are central to the definition of the Anthropocene, and the debate regarding both the validity and point of onset of the Anthropocene, as Mike Hulme (2016) has indicated, keeps erupting into cultural, political and scientific discourse.

Although the Anthropocene may never become an official geological epoch (Gibbard and Walker 2014), many researchers—among them several archaeologists—are productively working with this epoch ‘in

the making' (Swanson et al. 2015) and 'of our making' (Syvitski 2012). The Anthropocene Working Group (AWG) of the Subcommittee on Quaternary Stratigraphy—which is assigned by the International Union of Geological Sciences' (IUGS) International Commission on Stratigraphy (ICS) to weigh the claims for and against the formal definition of the Anthropocene as a new geological epoch—at least finally appears to have reached its last audit. Several AWG members recently advanced a mid-twentieth century onset of the Anthropocene (Zalasiewicz et al. 2017), marked in particular by the nuclear fallout from the use of atomic bombs, the massive rise in introductions of invasive species to fragile environmental niches and the significantly increasing amounts of plastic pollution in soils (Waters et al. 2015, 2016; Zalasiewicz et al. 2015, 2016). Most members of the AWG now subscribe to this proposition, given that human influences, impacts and consumption grew exponentially around the 1950s; this assertion is often illustrated by graphs that plot salient evidence for runaway socio-economic and environmental developments on a global scale (Steffen et al. 2007, 2011; Williams et al. 2016).

One of the main critiques concerning recent debates surrounding climate change and the Anthropocene, however, is that many aspects of the dialogue are lost by globalizing the perspective in this way. This pattern of omission includes the significant relationship between the epoch and specific, historically-situated societies. The Anthropocene is typically made abstract and distant, rendering even the most compelling scientific facts ineffective when it comes to changing the individual decision-making processes and behaviours that ultimately underwrite the unfolding epoch. Framing the Anthropocene as a global phenomenon not only detracts from the actual, uneven distribution of blame and responsibility (Malm and Hornborg 2014), but it also distances individuals and communities everywhere from local events, processes and narratives. This distancing arguably further removes any sense of responsibility, urgency or agency.

The proposition of a mid-twentieth century start date for the Anthropocene challenges archaeology's role in this research field and the attendant public debate. In this article, we do not propose counterclaims for earlier dates, which instead use anthropogenic markers such as megafauna extinctions (for example, Malhi et al. 2016) or agriculture (for example, Boivin

et al. 2016), but instead accept the aforementioned proposition of the epoch's establishment in the mid-twentieth century. Our approach aims to address the Anthropocene and its significance from an archaeological point of view, which blends contemporary archaeology's attention to materiality, agency and tele-connections with environmental archaeology's concerns for human impacts and society's entanglement within ecological frames of reference. Through careful field investigation, we focus on local instead of global events, processes and narratives and query how these local dimensions reflect and connect with the global Anthropocene. This paper presupposes that, in the 'Age of Humans', we can neither separate environmental histories from political or economic histories, nor separate political or economic histories from environmental histories: rather, these are conjoined (Chakrabarty 2014). By using local instead of global perspectives, the approach we take to address the significance of the Anthropocene grounds us 'at home' by using specific archaeological methods applied at the locale of Søby, a former open-cast, low-grade brown coal mine in Central Denmark. Rather than contributing to the conceptual discussion around the Anthropocene and its controversial status and inception, we instead draw on established archaeological methods to engage with the contemporary conundrums of climate change, especially those occurring 'at home', and to make the archaeological past 'usable' (Stump 2013) in the context of what may be termed 'post-Holocene adaptations' (Binford 1968).

The Søby Brown Coal Mine

In order to bring the Anthropocene 'home', we have focused on what at first glance looks like the most mundane and unremarkable place in Denmark: the former brown coal mine of Søby in Central Jutland (fig. 1). Prior to the 1940s, Denmark relied heavily on the import of stone coal, primarily from England, which provided approximately 80 per cent of the nation's energy consumption (Kristensen 2009). During the Second World War, however, Denmark was cut off from importations, resulting in the expansion of national brown coal extraction. Between the 1940s–1970s, poor-quality brown coal was extracted from Søby for both domestic and industrial use. Søby was the largest of the brown coal mines in Denmark, providing work for more than 3,000 men during the Second World War (Rolsted 2006). Many of these men moved their families to Søby, and several small

transient ‘villages’ arose around the mining areas

After the war, the import of stone coal from England resumed, leading to the decline of domestic brown coal production. This resumption of imported energy resources effectively ended the era of Danish brown coal extraction, and, a few years later, Søby was abandoned. Today, only the traces of the surrounding environment’s rapid transformation bear witness to the extensive

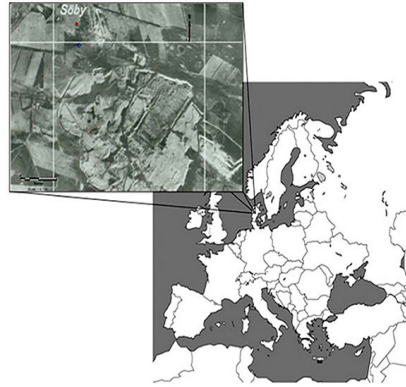


Fig. 1. The location of the Søby mining area in central Jutland, Denmark, and a 1945 aerial photograph, when mining activities were extensive.

extraction activities that occurred during brown coal mining. This brief episode in Søby is often described as a ‘Klondike’-like economic adventure that brought temporary wealth to the area, albeit at the cost of significantly formatting, damaging and destroying the local landscape. It is this latter aspect that is usually downplayed in popular narratives about Søby, both at the local museum and in recollections of former brown coal workers (for example, Kristensen 2009 and Rolsted 2006).

The mining activities left deep, now mostly water-filled, scars in the landscape and have left the local soils unconsolidated and contaminated. Before the mining activities, there was only one natural lake in the area, Søby lake (*Søby Sø*). Today, more than 700 artificial lakes, all polluted and discoloured by ochre, dominate the area, covering almost 470ha (Svendensen 2007). In addition, the local flora is beset with invasive species, in part deliberately planted by the Danish Nature Agency (*Naturstyrelsen*) in an attempt to reclaim the landscape, albeit with limited success. Instead, the legacy of these mining activities is a disturbed, transformed and destroyed landscape: an Anthropocene landscape, complete with novel communities of plants and animals (for example, Müller et al. 2017). Today, treacherous slopes and quicksand pools, mainly the consequences of the unconsolidated soils, are dangerous for people to roam (fig. 2).



Fig. 2. Multilingual warning signs at Søby today (scanpix, with permission).

The actions and processes that led to this radical transformation, if not destruction, of the local landscape are cultural, their outcomes environmental. The broader site of Søby represents cultural as much as natural heritage, but it is presently managed by the Danish Nature Agency. More important, however, is the point that both Søby's natural and cultural heritages are of a darker shade (McAtackney 2014; Strange and Kempa 2003; Thomas et al. 2016). 'Dark heritage', or the tangible and intangible remains of unsavoury, unpleasant and unwanted pasts, is most commonly explored through the remains of war, internment, slavery and other aspects of political history. We extend this notion here to include 'environmental dark heritage', the socio-ecological debris of earlier destructive human actions on the environment. We argue that Søby aptly and eerily mirrors global processes of the Anthropocene at the most local of scales. Its 'dark' environmental heritage, however, is not commonly represented as such.

The Søby Brown Coal Museum

In 1979, the mines in Søby closed for good (Rolsted 2006). Following this, Søby Brown Coal Museum, a small open air and privately-owned

museum, was established adjacent to the mining areas. A walkabout through the museum makes it abundantly clear that the story of Søby is told as one of progress, success and laudable male enterprise. The political, economic and environmental histories have been sanitized and separated. In fact, environmental histories are all but absent in the museum narrative, though they remain starkly visible in the transformation of the very landscape surrounding the museum. The economic history of the mine is valorized, its environmental history suppressed and subjugated to the dominant narrative of progress. Moreover, by partitioning the cultural aspects of Søby, curated and represented by the museum, from the natural ones curated and represented by the Danish Nature Agency, these histories and their heritages are unwittingly disjoined. Throughout the Søby museum, the atmosphere is nostalgic and romantic, with a hint of nationalism, in line with the prevalent atmosphere in Danish museums (cf. Kristiansen 1993). The interiors of the coal workers' reconstructed homes are spotless, although in reality they must have been covered by dark coal dust from the mines. The exhibits have been wiped clean of Søby's dark heritage.

Excavation as Conjoining

Our aim was to conjoin these political and environmental themes from an archaeological perspective. It is in the soil matrix where aspects of and proxies for landscape transformations and cultural activities meet through contextual association. To this end, in 2015 we conducted a series of keyhole excavations in the brown coal mine's former habitation area. Following desk-based assessments (using historical maps) and field surveys (using metal detectors), two trenches were placed in areas at or near former houses, where a high degree of activity was expected. Unsurprisingly, due to the high mobility of the residences, no major structural remains were uncovered, although settlement pattern was not the focus of our investigations.

Instead, we retrieved a wealth of small finds. More than 500 finds were registered from the two trenches of no more than 8m². The majority of these finds appear to be mid-twentieth century garbage (Rathje and Murphy 2001): bent nails, a broken pair of nylons, eroded soda and beer caps, bricks, a can of paint, broken roof tiles, glass fragments, broken ceramics and small plastic objects. Using traditional archaeological approaches, we



Fig. 3. Find no. X065. The coin is marked with the seal of the Danish King Christian X. The red colour of the coin reveals that it is made of either copper of bronze, which means that the coin was mined between 1913 and 1923 (photograph courtesy of Rógvi Johansen, Moesgård Museum).

were able to securely date our finds and, with some of the more significant finds, our layers. One of these finds was a coin (fig. 3) minted under King Christian X (r. 1912–1947) no later than 1923, which thus provides a *terminus post quem*. Another find used for dating was a broken tableware plate (fig. 4). No plate sherds were missing, allowing the manufacturer to be identified as Alumina, now known as Royal Copen-

hagen. This type of tableware was produced in Denmark between 1885 and 1941 (Mikkelsen 2002).

The excavation also uncovered two functionally identical, yet materially different, objects: a porcelain stopper (fig. 5) and a plastic bottle top. The porcelain stopper originates from a common type of glass bottle used for mineral water. This bottle type was produced primarily between the 1930s and 1950s (Schlüter 1984), and the individual bottles were often in use over extended periods. The logo allows for the identification of a specific manufacturer: “A. Bach–Nørresundby” in Northern Denmark, approximately 120km from Søby. Hence, this bottle was produced in the region. Its plastic counterpart, however, is brandless, so a specific identification is not possible. It is an anonymous globalized object. This general type of bottle top became common in Denmark and the rest of the Western world after approximately 1950, following the widespread introduction of plastics.

We highlight these two finds because they efficiently illustrate changing systems of production, distribution and consumption. The porcelain stopper, dated prior to 1950 and thus before the proposed transition from

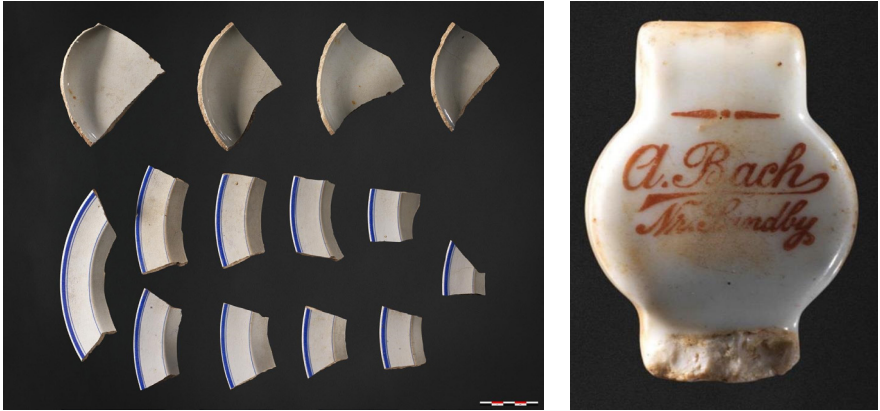


Fig. 4. (left) Find no. X066, X067, X070, X074, X075, X080, X081, X083 & X087. Together, these finds can be refitted to make a complete tableware plate produced by Alumina (now Royal Copenhagen). This specific type was produced between 1885-1941 (photograph courtesy of Rógvi Johansen, Moesgård Museum).

Fig. 5. (right) Find no. X088. A porcelain stopper for a glass bottle used for mineral water. These types of bottles were produced between the 1930s and the 1950s. This bottle came from Nørresundby approximately 120 km from Søby (photograph courtesy of Rógvi Johansen, Moesgård Museum).

the Holocene to the Anthropocene, highlights local networks of production, distribution and consumption, as well as the reuse of objects over extended periods of time. The plastic bottle top, postdating the 1950s and thus situated within the Anthropocene, acts as a proxy for and material result of what some would call ‘the Plastic Age’ (Thompson et al. 2009). Indeed, plastics are one of the key ‘techno-Leitfossil’ (cf. Zalasiewicz et al. 2016) types of the Anthropocene. Together, these two objects signify changing patterns of human production, consumption and disposal. We see a dual transition: a move away from object re-use towards disposability and the significant introduction of plastic as a key raw material. In addition, plastic is in part made of fossil resources. It requires energy input in its production and, in our case, the final product was redistributed to the locale of coal extraction for consumption and eventual disposal. The vicious circle of the Anthropocene, in which extraction, production and consumption are linked and reinforce each other, becomes closed and traceable through seemingly mundane objects such as the plastic bottle top described here.

From Excavation to Exhibition

The Søby coal mine, we argue, presents a microcosm of processes and outcomes that globally characterise the Anthropocene. Our finds reflect the small, intimate and local actions of actual people who have collectively written themselves into the grand narrative of the Anthropocene (Malm and Hornborg 2014; Szerszynski 2012). These actions, seemingly innocent or quotidian, can be placed into the context of dark environmental heritage of the Anthropocene.

The finds retrieved at Søby, particularly the two bottle tops highlighted above, were subsequently used to sketch out a different version of the Søby story than the one told at the open-air museum in Søby itself. Our version of the Søby story is darker and intended to stimulate debate. A platform for such debate was provided by a temporary exhibition entitled 'Mild Apocalypse: Feral Landscapes in Denmark', staged in 2016 at the newly opened Moesgaard Museum in Aarhus, Denmark. The exhibition was well received in the press, and over 400,000 people visited Moesgård Museum in 2016 (<http://www.visitaarhus.dk/aarhus/besoegstal-paa-attraaktioner>).

This exhibition drew on the diverse research conducted under the aegis of the AURA project (Aarhus University Research on the Anthropocene) and our own C3NET-project (Climate|Culture|Catastrophe Network). Here, the often-valorised dimensions of modern life (for example, domestication of unproductive landscapes, colonizing spirit and wealth accumulation) are turned upside down and placed into the perspective of the environmentally-dark heritage of the Anthropocene. Hence, the purpose of the exhibition was not only to inform visitors about the often subtle, yet ultimately catastrophic, aspects of the Anthropocene, but also to allow them to reflect on the role of cultural activities, and indeed on their own roles, in the unfolding of the Anthropocene (see Blæsild and Beck 2016; Brichet et al. 2017). Set against the otherwise valiant efforts of science and natural history museums to tackle issues of climate change (Cameron and Deslandes 2011; Cameron and Neilson 2015; Cameron et al. 2013), we instead aimed to focus on the homely, intimate and cultural facets of this wicked and hard-to-grasp problem (cf. Harvey and Perry 2015).

The media are replete with heart-wrenching stories of the bleaching of the Great Barrier Reef, rising tides swallowing faraway islands and melting ice at the poles (O'Neill and Smith 2014). We usually hear only about this 'harsh apocalypse' of the Anthropocene, as if it were solely happening on a global scale, in remote locations. We more rarely hear about the 'mild apocalypses' happening in our own backyards, at least in part due to our own actions. It is this 'mild apocalypse' that is illustrated so strikingly by Soby and the transformation of its surrounding landscape. In this way, our archaeological investigations serve to connect individual actions to the global catastrophic phenomena of the Anthropocene. The Soby locale, we argue, presents a local microcosm of a potential global future of unintended consequences, human-induced environmental catastrophe and economic overexploitation, along with its valorization. These all have implications for archaeological field practice and interpretative narratives, as well as dissemination strategies.

By being exhibited in a prominent museum of cultural history, the artefacts served as a point of entry into discussing the environmental dimensions of human action. More specifically, the exhibition's focus was at a very local scale, where the Anthropocene is concrete and tangible, instead of abstract and distant. Currently, cultural history museums are generally removed from public debates about climate change. But, seen in the light of the Anthropocene, climate change no longer is, and maybe never has been, a topic exclusive to natural history and natural sciences. Given the plethora of people that visit museums of cultural history worldwide (see, for instance, <http://www.egmus.eu/>), perhaps we should seriously consider telling our histories and prehistories of both the Anthropocene and the Palaeoanthropocene (Foley et al. 2013) in a different, and perhaps environmentally-darker, tone.

Debates about the validity and onset of the Anthropocene are as much political as they are scientific. Our field project and associated exhibition situate archaeology within that discourse and further conjoin environmental, political and scientific discourses in this age of anthropogenic climate change and anxiety (Dawdy 2009). We believe that identifying a start date of approximately 1950 for the Anthropocene opens up exciting possibilities for developing both a post-Holocene

environmental archaeology and, indeed, an evocative ‘environmental archaeology of the future’. The year 1950 has always marked ‘the present’ for those working with radiocarbon dates, so placing the anthropogenic ‘Golden Spike’ (Krajewski and Hannah 2015) at that point in time situates the Anthropocene within an archaeological future.

Contemporary archaeologists and heritage specialists have addressed and continue to address both present and future concerns (Edgeworth 2014), but environmental perspectives tend to be absent from these considerations (see, for example, Wurst and Mrozowski 2014). Environmental archaeologists, in contrast, are aware of those issues, but tend to focus on deep time and rarely engage directly with the public or policy-makers through the frame of heritage (Riede et al. 2016a, 2016b). Heritage specialists were the first to stress the conjoining of cultural and natural heritage (Holtorf and Högberg 2015; Lowenthal 2005). The emergence of the Environmental Humanities, especially their new ways of thinking nature into culture and thinking of the environment as a legitimate historical actor, is also stimulating environmental archaeologists (such as Richer and Gearey 2017) to reflect on these issues. The heritagization of human-environment interactions and the light as well as dark traces that they leave in the archaeological record may be a productive avenue for further conjoining political and environmental pasts, precisely because the notion of heritage has become so firmly entrenched in contemporary political and public discourses. Framing such conjoined contemporary and environmental archaeologies as dark heritage taps into a vernacular suitable to engaging local, national and transnational identities. This framing also potentially generates individual, as well as perhaps political, action towards more sustainable futures. Furthermore, thinking of conjoined human-environment pasts as heritage makes them fully legitimate subjects of historical or cultural museum studies and displays. Further still, museums, including cultural history museums, can be important catalysts of social change in this context (Rees 2017). The acceptance of a shallow Anthropocene conjoins contemporary archaeology, environmental archaeology and dark heritage studies, pulling archaeology right into this political debate. It also offers faint hope for our post-Holocene future by stressing how individual and collective actions can not only make, but also unmake, an apocalypse.

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