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Communicating with future generations: what are the benefits of preserving cultural heritage? Nuclear power and beyond

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In 1977, the first fast breeder nuclear reactor in the world to provide electricity to a national grid was shut down for the last time. The Dounreay Dome on the North coast of Scotland, near Thurso, Caithness, was completed in 1958 and its silhouette later became an emblem of the Atomic Age. As the decommission of the entire site proceeds, incorporating even other defunct nuclear reactors and associated facilities, the question arose whether the Dome can and should be preserved as cultural heritage for the benefit of future generations. Using the example of the legacy of the nuclear power station at Dounreay, this paper discusses the question what it means to preserve something for the benefit of future generations.
Keywords: Dounreay Dome, preservation, benefits of heritage, future generations

Nel 1977, venne spento per l'ultima volta il primo reattore nucleare al mondo per la produzione energetica. Il Dounreay Dome nella costa settentrionale della Scozia, vicino a Thurso, Caithness, è stato completato nel 1958 e la sua silhouette *più tardi sarebbe divenuta emblematica dell'era atomica. Man mano che procede lo smantellamento dell'intero sito, incorporando anche altri reattori defunzionalizzati, ci si chiede se il Dome vada preservato come patrimonio culturale per le future generazioni. Usando l'esempio dell'eredità della stazione nucleare a Dounreay, questo articolo discute cosa significhi preservare qualcosa per il bene delle future generazioni.*
***Parole chiave**: Dounreay Dome, conservazione, benefici del patrimonio, future generazioni*

1. Introduction: preserving the legacy of a future technology for future generations

In 1977, the first fast breeder nuclear reactor in the world to provide electricity to a national grid was shut down for the last time (fig. 1). Dounreay, on the North coast of Scotland, near Thurso, Caithness, was the United Kingdom's centre of fast nuclear reactor research and devel-

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Fig. 1. Commemoration of the 1977 shut-down of the Dounreay fast reactor.

opment from 1955 until 1994. It is now Scotland's largest nuclear clean-up and demolition project, managed by Dounreay Site Restoration Limited (DSRL). Once a place where future-oriented science and engineering was celebrated, it has become a site of construction, demolition and waste management. It can therefore be said that "Dounreay represents a future that is perpetually receding" (Hollings 2011; see also Dunlop 2011). DSRL's overall objective in decommissioning Dounreay is to close down the site by 2025, and ultimately leave it in a safe condition for future generations. Institutional control will however continue up to 2078 and probably well beyond until the 2300s when the remaining residual radioactive contamination is expected to have decayed to insignificant levels (Gunn, Croft 2010; DSRL 2013).

As part of that process of decommissioning, the Nuclear Decommissioning Authority (NDA) and DSRL, in partnership with Historic Scotland and consulted by Atkins Heritage, have worked together on establishing a strategy for creating a cultural legacy of Dounreay. The resulting Dounreay Heritage Strategy considers the entire site and defines heritage in a broad sense, including both tangible and intangible dimensions

Fig. 2. Dounreay present view.

such as buildings, areas and objects of the site, digital and print paper records and images, portable objects, and personal and collective memories of former employees and local residents (Gunn, Croft 2010, pp. 25-29). The strategy states that "it is clear that there is 'something' about Dounreay that is worth celebrating, conserving and communicating to future generations" (Gunn, Croft 2010, p. 52). It then specifies what exactly should be celebrated, and how this can be done both safely and affordably involving the physical conservation of buildings, the retention of objects, written documents and told memories, and ultimately "communicating the story of Dounreay to current and future generations" (Gunn, Croft 2010, p. 53).

One locally contested question in relation to the cultural legacy of Dounreay concerns the famous spherical Dounreay Dome, completed in 1958 and since then sometimes used as an emblem of the Atomic Age. The discussion is about whether it can be preserved or not, given its radioactive contamination and the costs of cleaning it. Whereas one side of the argument claims that the Dome is unique and contains intrinsic value as "a triumph of Scottish design, engineering and construction – a world first" (Cowie *et al.* 2010, p. 28) so that it ought to be preserved for the benefit of future generations, the other one maintains that "fac-

tors such as hazards from radiological contamination, restrictions on [future] land use and the technical and economic requirements of decommissioning" (Gunn, Croft 2010, p. 57) favour the dismantling of the Dome in the best interest of future generations (fig. 3). Both sides therefore draw in their arguments on the supposed advantages and disadvantages for future generations.

BOX 1: The view on Dounreay by future generations in 20-30 years from now

It is almost certain that over the course of the next 20 or so years, new nuclear power stations will be built across the world and in the UK; and that nuclear power will play an increasing role in managing carbon emissions worldwide. [...] Long-term issues relating to historic and ongoing waste generation may also be addressed in this timeframe. Assuming that the world avoids another Chernobyl-type incident, public perceptions of nuclear technology may well become more positive and consequently there may be a shift in public attitudes towards our nuclear heritage.

Assuming that the expansion in nuclear power occurs and that public attitudes change, which is by no means guaranteed, would Dounreay be seen in a different light in 20 or 30 years time?

In technological and historical terms Dounreay's importance and value would not have significantly changed. It would still represent a technology that had a minor role in the development of the nuclear industry and it would still represent the basic trend of historic development in the late 20th century. [...] However, the current worldwide Generation IV nuclear reactor project is reviewing and examining six types of nuclear reactors for the period after 2030. Three of the types under review are fast reactors. [...] It is, therefore, possible that, in say 30 or 40 years time, DFR and PFR could be seen as early pioneers of one branch of nuclear technology.

It is also possible that by c. 2030 or 2040 Dounreay and the wider mid to late 20th century nuclear industry in the UK, will just be seen as an example of another British industry that, much like many others, pioneered great technological advances but ultimately failed to sell them to the wider world. The only exception to this in Dounreay's case will be the achievements of the decommissioning team, whose work at Dounreay will by then be a world leading example of the safe clean up of a complex nuclear establishment.

If nuclear power becomes more acceptable and provides a form of safe energy with a low carbon load, then it may become increasingly viewed in a positive light. If this occurs then it is likely that views of Dounreay as a nuclear site and of the role of the DFR sphere as an archetypal image of nuclear power will also shift. […] [I]t may be that the sphere will increasingly be seen as a positive image for a technology that is seen as beneficial.

But, will the spherical iconography still be as strong in 20 or 30 years? It is probable that, like current designs, the next round of stations will use rectilinear buildings or domed structures to house their reactors. Given this situation by c. 2030 or 2040 it will be 70 or 80 years since a full sphere was constructed to house a nuclear reactor. Is it realistic to expect the media, public and industry to continue to use the sphere as the archetypal image of the industry? More likely another image, perhaps the dome (semi-sphere) or maybe some striking new architectural design will come to visually represent the industry and the spheres will be seen as a stage in the industry's development.

[…] It is almost impossible to predict at the local level how Dounreay will be perceived in the future as there are just too many variables. What is certain, is that there will be some people living in the area who worked on its decommissioning and have memories of taking it down piece-by-piece but few who operated and ran it as a working power plant and research centre. This will ensure that, whatever the outcome for Dounreay, it will be remembered in the local community for at least a few more decades.

(Source: Gunn, Croft 2010, pp. 43-45)

The DSRL Heritage Strategy contains an explicit section about the view future generations in 20-30 years will have on Dounreay (see Box 1). It demonstrates how the future is perceived by those who wrote the strategy. The base line is the present: will more of our own sorts of nuclear power stations be built in the future, and if yes, which type and which shape? How would that impact on how we see the Dome as heritage in the sense we use the term today? Will there be another incident like the one we remember from Chernobyl 1986 (or for that matter Fukushima 2011)? How will all of that change the way nuclear technology and the shape of the Dome will be perceived in future society? Will the media communicate about nuclear power in similar ways as today? Is the decommissioning that takes places today going to be more successful than the industrial operation of the site which recently was ter-

Fig. 3. Dounreay in 2025 without the Dome?

minated? Will we at some point have solved our current problem of taking care of nuclear waste?

At the end of the day, all such discussions are mainly guesswork, built on assumptions about the future that are based on our own world and offering at best possibilities, pure speculation at worst. What we know for sure, in this view, is trivial: some people will remember the decommissioning that takes place today over several decades into the future. For everything else applies that it "is almost impossible to predict [...] how Dounreay will be perceived in the future as there are just too many variables."

The way the DSRL Heritage Strategy is formulated corresponds to a general vagueness in the heritage sector when it comes to specifying which future generations the heritage is being preserved for. In a joint project we are currently investigating future consciousness in the heritage sector (Holtorf, Högberg 2014). This research involves the study of strategy and policy documents mostly originating in Sweden, the UK and at global level (UNESCO), as well as interviews with circa 70 professionals working in the heritage sector in Sweden (ca 50), England (7), at UNESCO (5) and in various other countries (9). The results remain to be analyzed in detail but some trends are clear. The heritage sector does not usually specify which future it works for but when pressed heritage professionals tend to perceive either of a future that lies at the most 2-3 generations ahead or of an unspecified, infinite future that is "forever" or "until further notice".

Thus far, preliminary results of our on-going research also suggest that the heritage sector generally assumes that the future, for lack of reliable predictions, will essentially be a continuation of the present (Holtorf, Högberg 2014). We have not met many attempts to understand how the future will differ from today. Very few in the heritage sector have professionally thought very deeply about the future at all (but see Spennemann 2007a; cf. 2007b, 2007c). Indeed, in our interviews it transpired that some heritage professionals do not see a need to consider a longer future in their work at all. This state of play ought to be unsettling in a sector that champions Time, manages manifestations of historical change and often takes pride in offering society a long-term perspective. Arguably, this failure is all too human though. The tendency to assume that the future will in many ways be like the present corresponds to the way people, as individuals, "expect to change little in the future, despite the fact that they have changed a lot in the past" which "bedevils their decision-making", as recently reported in *Science* (Quoidbach *et al.* 2013).

2. Predicting the needs of future generations

For the coming decades and up to a century ahead, a number of broad trends are visible already now. They can help us making sense of the future, however unpredictable it may otherwise appear. However, the point here is not to argue in detail for the exact odds of any particular development to occur in a specific way. We rather want to demonstrate that even widely acknowledged, broad trends have not yet been taken very seriously within the heritage sector. These trends are almost certainly going to have consequences for the heritage sector, both opportunities and threats, and they can offer natural starting points for any discussion of the significance of heritage for future generations. In this way we could start to think about future benefits of heritage that differ from how heritage benefits society today (see also Holtorf, Högberg 2013).

a. Demographic trends.

Within the developed countries the population is going to age so that even if the retirement age increases somewhat, ever larger proportions of the population will be retired. This means that we can expect a growing number of people age 60+ who both might be interested in heritage and have time to invest in it (Moore 2006). We can also expect a growing number of people suffering from old-age dementia in need of care and rehabilitation. Globally, more and more people will live in Asia but also in sub-Saharan Africa, whereas areas like Europe will be home to ever

smaller parts of the world population. Urban areas are growing, whereas rural areas are losing ever more inhabitants around the world.

b. Environmental trends.

Global climatic changes are likely to occur. Their effects will vary for different parts of the world and affect temperatures, precipitation, storms, currents, and sea-levels. All this will have consequences for population sizes, subsistence patterns, land-use, travel destinations – not the least in relation to heritage sites (Barthel-Bouchier 2013). In addition, population expansion and growing economic pressures will in some areas likewise have effects on the environment, for example through increasing erosion.

c. Economic trends.

The globalized post-industrial economy with global markets and multinational corporations is here to stay and will affect ever more world regions. At the same time it seems possible that global regulatory systems and a preference for local products will increase as well. Developing regions of the world will catch up with the already developed parts of the world and their populations will increase their living standards and gain wealth. Regional conflicts about political influence and access to globally significant resources are possible. At the same time, the developed economies will struggle to maintain the existing wealth in areas like Europe and North America, which in turn has implications not only for state and corporate budgets but for all people's behaviour, preferences and health.

d. Social trends.

As a result of increased global migrations, connecting to demographic and economic trends, cultural diversity in each society will increase, especially in urban areas. Fewer people will share their personal and collective identities with their neighbours and more people will negotiate their lives and life-stories while moving in-between different places and social contexts, amalgamating different cultural identities into something new (Croucher 2003). Concurrently we can expect social divisions to increase as the rifts between people in terms of income, class, ethnicity, religion appear to widen rather than narrow.

e. Technological trends.

As computerization progresses, ever more processes in society will become fully or semi-automated. Production, service provision, retail and consumption will increasingly be computerized and customized to specific needs. More and more people will more often be able to work, shop

and consume remotely but they will at the same time also be ever more interconnected. A range of inter-linked electronic devices linked to social networks will seamlessly connect individuals with content providers and with each other.

3. Back to the future at Dounreay

The trends listed are all broadly acknowledged within current futurology (e.g. Bindé 2001; Steffen 2008). Despite this, the heritage sector has not let itself be affected by any of them in a profound way. Where are the think-tanks, conferences, and commissioned studies investigating possible implications of these trends of the coming few decades for the heritage sector? What are the strengths and weaknesses of the heritage sector in the light of such developments, and which new threats and opportunities are appearing on the horizon? Divisive uses of the past and cultural heritage by left- and right-wing extremists in Europe need to be monitored and controlled (Gustafsson, Karlsson 2011). But even more important might be to identify new possibilities for uses of cultural heritage for the benefit of society in the future. The few studies on future issues of cultural heritage that have recently been published (e.g. Rèmond-Gouilloud 2001; Moore 2006; Labadi, Long 2010; Solli 2011; Holtorf, Högberg 2013; Jigyasu 2013; Barthel-Bouchier 2013) are still very tentative and offer neither the depth of analysis nor the creativity in thinking that is required to address concrete issues like what to do with the Dounreay Dome.

It is hardly the best strategy to simply amass in archives a range of source material for future historians and archaeologists who – like every new generation of scholars – are likely to adopt new approaches and ask new questions, rendering much of our efforts meaningless. Already today we see that a majority of archive users are not industrial archaeologists or social historians but genealogists who are not very interested in nuclear technology (Cowie *et al.* 2010, p. 29). Future generations will not necessarily agree either with the judgement of some campaigners that the Dounreay Dome is "a triumph of the human spirit, a manifestation of creative energy and verve and a unique piece of heritage to leave to our descendants for their inspiration and wonder" (Anonymous n.d.).

Historical geographer David Lowenthal (1995, p. 393) may well be right in stating that "nothing is less likely than a plausible future." But this must not stop us from at least trying to provide real benefits for future generations by making the future as plausible as possible. Otherwise, why preserve for the future at all? The first thing to do is to learn

Fig. 4. Dounreay Dome in the 1950s. What did it mean at the time? What do we make of the site today? How will future societies value the site?

asking the right questions. These questions must not start in our own present but in the situation of the future generations for whom we conserve the heritage. We need to understand that this future will be different from our present today and that our present concerns and judgments may therefore not be appropriate at all (fig. 4). The question is not what we can retain from a site like Dounreay, how we value this legacy and how we may want to communicate its current significance to people we know today. The question is rather how future generations will value the site and how some of them may want to communicate the actual future significance of the site to people living then.

One possible strategy developed in Future Studies is to create a series of varying scenarios. Scenarios are carefully researched, possible futures based on extrapolating into the future certain parameters observable today. They are invented for the purpose of imagining different possibilities and their consequences, and they aim at informing present-day strategies to achieve the best possible outcome whatever the future actually holds (Schwartz 1996). For making informed decisions about potential benefits of preserved cultural heritage for future generations, we need to think through the implications of different scenarios involving heritage in the future. Here we cannot offer any detailed scenarios of

this kind. Instead we will have to contend ourselves with listing some of the questions that such scenarios will have to flesh out and develop, both generally and in relation to Dounreay, thinking – in line with common thinking in the heritage sector – up to three generations ahead:

Which needs of heritage will an ageing population have that increasingly lives in urban areas? How will the legacy of Dounreay be able to contribute to the well-being of older people outside Caithness?

What effects will environmental degradation have on the preservation and accessibility of heritage and indeed on priorities in society? Which significance will the story have that can be told about nuclear energy research and continuing radiation at a decommissioned Dounreay?

Will heritage be instrumental in working for peace and global justice in the world? Which helpful contribution is the legacy of Dounreay going to make to the new collective identities that are emerging in a future Europe that will play a different role in the world economy than now?

How will heritage be able to increase social cohesion in societies characterised by diversity and differences between various groups of people? Which cultural identities will be evoked by the heritage of Dounreay?

Will heritage be able to exploit or compensate for rapid technological progress and changing ways of life? In which kind of social networks will the heritage of Dounreay become meaningful?

For thinking much longer ahead than a few generations we will need to think of different questions and different scenarios with great variability between them. Arguably, the issue of nuclear waste can inspire the heritage sector in its future thinking.

4. Learning from nuclear waste

Worldwide, there are now some 300,000 tons of high-level nuclear waste, with an additional 12,000 tons being added every year. The currently favoured method for discarding this waste is geologic disposal in mined tunnels drilled into stable geological formations several hundred meters below the surface. The process of selecting appropriate locations for such final repositories of high-level radioactive waste is now well under way in several countries. The goal is to isolate nuclear waste from the human environment, near enough permanently. It takes 100,000 years or more before highly radioactive nuclear waste is no longer deemed dangerous for human beings. Present and future generations are therefore faced with the task of safeguarding this hazardous waste for very long time periods. After the waste has been finally disposed of underground we need, among other things, transmit information over thousands of generations

about the location, character, and content of these large yet on the surface invisible, underground repositories (Holtorf, Högberg 2014). This is at the same time an impossible and a necessary task.

Never before in the history of humankind has any comparably complex information been communicated to human beings living thousands or even hundreds of thousands of years in the future. Any physical marker at the location will struggle to exist over such long time periods, given the expected impact of major climatic changes including, for example, a new ice age during which massive layers of ice will abrade the surface of the land. Archives will be kept all over the world but we cannot guarantee that they will survive sufficiently long. Moreover, we know neither which written languages will be understood nor whether pictograms or symbols will be interpreted in the way we meant them. In fact, we cannot even be sure that the humans receiving our messages will belong to the species Homo sapiens which is not older than 200,000 years and may not exist in the same form a few hundred thousand years ahead. No one can honestly claim to be able to transmit information tens of thousands of years into the future. Still it needs to be done.

The limited interest in future thinking in the heritage sector contrasts sharply with the commitment that we have come across among professionals in the nuclear waste sector addressing concerns that lie in the long-term future. For example, the Swedish Nuclear Fuel and Waste Company unashamedly writes on one of its banners used in external representation: "Think about your future. That's what we do. 100,000 years into the future." These are more than slogans, as a number of comprehensive studies manifest which were initiated and/or supported by the nuclear waste industry in Sweden, the United States, and elsewhere (see e.g. Human Interference Task Force 1984; Hora *et al.* 1991; Lomberg, Hora 1997; Benford 1999, Part One; Buser 1998; Bandolin, Sörlin 2007; recent overviews in IAEA 2008 and Drack 2013). These works contain detailed studies of the implications of the likely circumstance that our descendants in the distant future, or indeed other future forms of intelligent life, will not think like us and may not share any modern language, nor our symbolic code or our habitual ways of engaging with material markers or other media left for their benefit. Since the 1980s, artists and researchers from several disciplines have thus experimented in a range of different genres and designs in order to accomplish the task at hand.

The future thinking of heritage management has much to learn from the nuclear waste industry in appreciating the implications of what it means to want (or be compelled to) preserve something for the long-term future.

5. Conclusions: how archaeological heritage will benefit people

The decommissioning process of the nuclear power station at Dounreay and the associated heritage strategy for the future now being developed and discussed provide important lessons for the cultural heritage sector at large. Thinking several decades and up to one century ahead we need to think more carefully how the preservation of heritage will provide future generations with actual benefits. It is not sufficient to speculate about what will happen in the future based on the implicit assumption that the future will essentially be a continuation of the conditions and known circumstances of the present, when in fact we know that the future will differ from the present as development over time is necessarily about change.

A better approach is to start from what we know about existing trends that will continue into future decades and imagine, on that foundation, future benefits of heritage that will differ from the kind of benefits we may expect to have in the present. A helpful tool are scenarios that flesh out possible futures and allow us to think through their implications for the value of future heritage and can thus inform our own decision on what and how to preserve for that future.

The underlying challenge of providing real benefits for future generations has a bearing also on communication in pluralistic societies. Both imply a need for finding ways of providing benefits for people who are different from oneself, not only in terms of their languages used but also in terms of their ways of thinking and their values. For example, whereas in the past heritage was primarily linked to ethnic nationalism and thus created senses of relatively homogenous collective identities, today it increasingly advances very diverse ethnic, religious, social or cultural identity projects (Taylor 1994). A heritage sector addressing the potential benefits and dangers of cultural heritage for future generations, formulated both as opportunities and threats, may be better prepared also to deal with the potential benefits and dangers, the opportunities and threats of cultural heritage in pluralistic societies in the present.

Important is also the question which media may be most appropriate for addressing the needs and benefits of future generations. Media differ not only in terms of their durability but also in terms of accessibility and intelligibility. Not every way of communicating will be accessible and intelligible to its intended audience. There are no doubt important lessons to be learned from the case of transmitting information about final depositories of nuclear waste to future generations up to 100,000 years ahead.

The controversial legacy of a nuclear power station currently in the decommission process and associated issues to do with radioactive material can perhaps prompt the heritage sector to develop a more elaborate and thought-through strategy about what it means to preserve for future generations and how to provide them with actual benefits. Nuclear heritage including nuclear waste is a special case of cultural heritage to be preserved for the future. Linking cultural heritage to this particular industrial case does not only place some controversial questions on the agenda of heritage management but it also challenges the sector with a specific long-term future.

At the site of Dounreay the future is currently staked out in some clear steps (tab. 1).

2025 - site closure
2078 - institutional control ends
2300s - residual contamination decayed
100,000 years ahead - high-level nuclear waste decayed

Tab. 1. The future schedule for decommissioning the site of Dounreay.

We hope that it soon will be possible to link preservation and communication strategies of cultural heritage to a similarly specific time schedule. We can learn a great deal from the work that has already been undertaken in the nuclear waste sector about the implications of different time frames for relevant actions we carry out today. We also need to become much more clear about realistic benefits that any preserved future heritage can have in such a perspective.

If Dounreay represents a future that is perpetually receding as it becomes heritage of the future, we need to prevent that contemporary cultural heritage sites represent a past that is perpetually receding and lack a clear role in the future.

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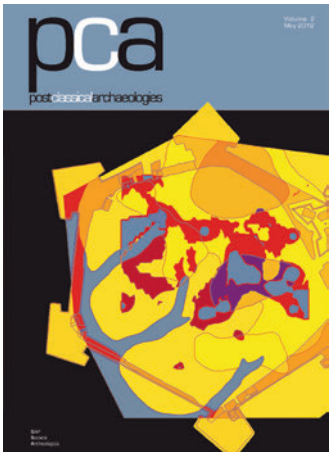

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