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LEGACIES

Rethinking the futures of heritage and waste in the Anthropocene

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Introduction

It could be argued that one of the requisite reorientations which the recognition of the Anthropocene epoch instigates for critical heritage studies is a temporal one – it necessarily forces a shift in attention away from the relations between past and present towards that of the present and future. In rethinking heritage studies *in* and *for* the Anthropocene (c.f. Harrison 2015; Harrison, Appelgren and Bohlin 2018; Harrison and Sterling 2020), one is immediately confronted with the material legacies of what Amitav Ghosh (2016) refers to as "The Great Derangement" and forced to consider the *unthinkable*: how the waste products of this epoch – its plastics, radionuclides, carbon monoxides, even climate itself – will form a persistent future archive of Anthropocene hyperobjects (c.f. Morton 2013) which will inevitably overshadow and outlast any intentionally preserved form of cultural heritage. The aim of this chapter is to begin to work through some of the implications of a critical rethinking of heritage ecologies through the lens of waste studies, framed within a broader emphasis on the value of such comparative approaches for critical heritage studies. In doing so, I draw initial inspiration from geographer Kevin Hetherington's (2004) framing of heritage as a category of both spatial and discursive placing which relates to broader, often cyclical practices of consumption and management of redundancy. In particular, I want to consider how bringing heritage and waste together helps us to retheorise both heritage and waste as forms of material and discursive *legacy* and to reconsider the ontological implications of living with, caring for and assembling futures out of both more and less persistent traces, residues and materials in the Anthropocene. In doing so, I map out a series of key conceptual terms which might provide the beginnings of a critical "toolkit of concepts" with which to navigate this newly expanded intellectual field. I draw on work undertaken as part of the collaborative, international *Heritage Futures* research programme (see Harrison et al. 2020). I begin by introducing this research programme and its framework before turning to look at some key concepts which I hope might prove productive in rethinking both heritage and waste in the Anthropocene.

Heritage futures

Heritage Futures was a large, collaborative, international research programme which involved ambitious interdisciplinary research undertaken by a team of 16 researchers to explore the potential for innovation and creative exchange across a broad range of heritage and related fields, in partnership with a number of academic and non-academic institutions and interest groups, undertaken over four and a half years from 2015 to 2019. The research was distinctive in its comparative approach which aimed to bring natural and cultural heritage conservation practices of various forms into closer dialogue with the management of other material and virtual legacies such as nuclear waste management. It was also distinctive in its exploration of different forms of heritage as distinctive future-making practices.

The research programme explored a large number of different practices within a range of divergent domains which are each dedicated to conserving and perpetuating ideas, words, objects, places, species, (both human and nonhuman) persons and things into more or less distant futures. In doing so, it sought to make a contribution to current discussions relating to the value of comparison in the humanities and social and historical sciences (e.g. van der Veer 2016), expanding them to the study of human and nonhuman social collectives. In developing the research, it was reasoned that a comparative analysis of different kinds of conservation and preservation practices might develop and open up the notion of heritage in creative and productive ways. Through a focus on conservation or preservation as a series of distinct creative, dialogical engagements between human and nonhuman persons, objects, places and practices, it aimed to explore heritage as distinctive processes rather than a series of "end products" of such practices (or, indeed, the values associated with those end products). And through an emphasis on heritage as forms of inheritance which may be positively, negatively or even ambiguously valued, it aimed to bring the field of critical heritage studies into conversation with the study of other hyperobjects (cf. Morton 2013; see also Breithoff 2020) and Anthropocene legacies, such as waste and climate. It contended that a reframed notion of heritage as material and discursive legacy would allow us to move beyond the uncritical valorising of certain objects, places and practices from the past in the present to reorient heritage studies more explicitly as a study of future making or worlding practices by showing how these legacies of the past in the present form templates for the organisation of new contingent realities and the construction of divergent future worlds. Working across natural and cultural heritage, the work was informed by Chakrabarty's (2009) observations of the ways in which climate change dissolves the distinction between natural and cultural history. Here the research programme joined a new critical engagement with nature conservation (e.g. Benson 2010) and extinction studies (e.g. Heise 2016) in exploring the distinct cultural frameworks which produce "natural heritage" (e.g. see Breithoff and Harrison 2018, 2020; Harrison 2017) – and the ways in which "cultural heritage" is not outside of but integrally a part of it (e.g. DeSilvey 2017; Harrison 2015). It also connected both conceptually and empirically with contemporary anthropological engagements with "futures" (e.g. Appadurai 2013; Salazar et al. 2017) and with current creative academic engagements with global climatological and environmental change (e.g. Haraway 2016; Tsing 2015; Tsing et al. 2017).

Conceptually, the research programme drew on and expanded previous work by the authors and others on the application of assemblage and actor network theory to the critical investigation of heritage and museums (Macdonald 2009a, 2009b; Harrison 2013a; Bennett et al. 2017), applying these perspectives to a range of other collections and institutional contexts. It

was strongly influenced by the comparative perspectives of the "Endangerment and Its Consequences" project (Dias and Vidal 2016) in exploring a range of different cultural and natural heritage conservation practices collectively, drawing on the perspectives of histories of science and science and technology studies more generally in doing so. It was also influenced by the "ontological turn" in the social sciences, in particular Karen Barad's (2007) agential realism and various aspects of science and technology studies in seeing heritage practices of various kinds as enacting new realities through contingent practices of assembling and reassembling bodies, techniques, technologies, materials, values, temporalities and spaces in particular ways (see further discussion in Harrison et al. 2020).

Towards an ecology of heritage as future making practices

If we are to see heritage practices of various kinds as enacting new realities through contingent practices of assembling and reassembling bodies, techniques, technologies, materials, values, temporalities and spaces in particular ways, what does it mean to speak of "futures", "realities" and "worlds" in the plural?

> This is how I produced what I would call my first step towards an ecology of practice, the demand that no practice be defined as "like any other", just as no living species is like any other. Approaching a practice then means approaching it as it diverges, that is, feeling its borders, experimenting with the questions which practitioners may accept as relevant, even if they are not their own questions, rather than posing insulting questions that would lead them to mobilise and transform the border into a defence against their outside.
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> *(Stengers 2005, 184)*

Invoking Isabelle Stengers' notion of ecologies of practices, I draw attention to the relative autonomy of different domains of heritage practices, with each of these domains specifying particular objects of conservation and specific accompanying methods of management. Examples of such domains include the fields of biodiversity conservation, built heritage conservation and endangered language preservation, each of which identifies a specific risk (respectively, loss of biological diversity, loss of cultural patrimony and loss of language and "culture") and an endangered object ("biodiversity", "built heritage" and "language diversity"). Each of these domains applies its own specific techniques for identifying, collecting, conserving and managing the endangered object and the factors that are perceived to threaten it (see Harrison 2015; Harrison et al. 2016; see also Dias and Vidal 2016). In thinking of how these domains exist contiguously and yet discretely from one another, I am influenced by Peter Sloterdijk's (2016) characterisation of the contemporary condition as one in which humans increasingly occupy a "foam" or complex ocean of fragmentary yet contiguous spheres. Insofar as heritage is generally tasked with preserving its endangered object for the "future" and each of these domains is concerned with establishing its respective conservation targets as both objects of knowledge and fields of intervention, these different heritage domains can be said to be actively engaged in the work of assembling and caring for future worlds. Although these domains of practice may sometimes come into relation with one another and may be sustained by discourses which arise from others, they often operate in relative isolation. Central here is a plural notion of heritage ontologies – understood as the world-making, future-assembling

capacities of heritage practices of different kinds and the ways in which different heritage practices might be seen to enact different realities and hence to assemble radically different futures (Harrison 2015, 2017, 2018; see also Holtorf and Högberg 2015a, 2015b).

At the core of this plural notion of heritage ontologies is the idea that futures are not simply emergent but that futures are designed. What I mean by this is that futures are built and assembled as a result of actions in the present which are formed out of particular constellations of things, persons, places and practices and their coming together – in conflict or collaborations – at a particular moment in time. Here I understand conservation as the maintenance of plants, animals, languages, practices, ideas, persons, things, traces, residues and materials from the past, in the present, for the future (and we often hear this claim made for heritage as being something from the past which is conserved for "future generations"). But most importantly, I suggest that different forms of conservation practices often work towards assembling quite different futures and quite divergent worlds – and in doing so, they have the potential to undermine or come into conflict with one another.

Legacies: heritage and waste

I want to illustrate something of the distinctiveness of certain forms of heritage practices and, indeed, the value of comparative approaches which seek to work across them by working through some of the ways in which the comparison between heritage and waste might generate new insights for heritage. Obviously I'm not the first person to bring together the concepts of heritage management and waste management. Aspects of this comparison appear in the work of Mary Douglas (e.g. 1966) and in Michael Thompson's well-known book *Rubbish Theory* (1979), while more recently, the geologist Marcos Buser has written on what he terms the "heritage of toxic waste" (2016) to draw attention to the durability and persistence of chemotoxic and radioactive waste materials. Geographer Anna Storm (2014, and chapter 3) considers the landscape scars of industrial processes including nuclear power generation as forms of heritage, and Cornelius Holtorf and Anders Hogberg have for some time been exploring questions of communicating the dangers of buried nuclear waste with future generations and the broader issues this raises for thinking through heritage (e.g. 2015a, 2015b). Staffan Appelgren and Anna Bohlin (e.g. 2015a, 2015b) explore the relationship between heritage and recycling in their Re:Heritage project. Bjørnar Olsen and Þóra Pétursdóttir's important "Unruly Heritage" project also addresses similar issues (e.g. see Olsen and Pétursdóttir 2016; Pétursdóttir 2017; Pétursdóttir and Olsen 2018), as does Breithoff's (2020) work on the heritage of the Chaco war. And there are also resonances of Timothy Morton's (2013) work on hyperobjects in the arguments I deploy.

But rather than start with any of these, I want to begin with the logics of bringing together questions of heritage and waste. Heritage is a term that simultaneously identifies an object, place or practice as something which has value and as something which is considered threatened or at risk. That risk might simply be a result of the inherently perceived threat of time itself – which implies processes of forgetting, decaying, eroding or becoming worn with age. Sometimes the threat is a more active one of demolition or destruction – the flattening of a building, the bulldozing of a tree, the destruction of a tract of landscape by mining, perhaps, or even more seriously, the extinction of a plant or animal species or the genocide of a group of people during times of war. The element of potential or real threat to heritage – of destruction, loss or decay – links heritage historically and politically with a

broader endangerment sensibility (I borrow this concept from my colleagues Nelia Dias and Fernando Vidal [2016]), which connects practices of cultural and natural heritage preservation across a range of different domains. This endangerment sensibility is articulated by way of practices of designation and listing (Harrison 2013a, 2016; Rico 2014, 2015). Even where a building, species or object is under no immediate threat of destruction, its listing on a heritage register – as something which is rare, unique or valuable – assumes a potential threat at some time in the future, from which it is being protected by legislation or designation. Waste, on the other hand, is a term which is clearly negatively valued – it designates a redundant object or useless by-product of some other operation. It is neither valuable nor at risk (although it might pose a risk to others). Yet both heritage and waste emerge from the same process of redundancy – these are both terms that denote superfluous objects which are no longer useful for the purpose for which they were originally produced. The museum and the rubbish dump might then be seen as two potential spatial end points for such redundant objects.

Containment 1: rubbish dumps and repositories

Or perhaps not so much end points as points in a cycle of consumption and re-use, as categories of spatial and discursive placement. Hetherington (2004) argues that disposal is not just about questions of waste and rubbish but is implicated more broadly in the ways in which people manage absence within social relations. Further, he explains that disposal is never final, as is implied by the notion of "rubbish", but that "disposal is a continual practice of engaging with making and holding things in a state of absence" (Hetherington 2004, 159). While Hetherington's concern here is with practices of consumption more broadly, I think his focus on the work of maintaining absence draws out another similarity between heritage and waste, which is that both are defined by practices of maintenance and containment. Intangible heritage practices require performance to maintain and preserve; nature and biodiversity are actively managed by practices of ecosystem service repair and management; endangered languages are recorded and archived, become extinct and might possibly be rediscovered and live again. But the important point here is that heritage and waste occupy a series of "other" spaces, outside of the realm of everyday life, set apart, sometimes hidden away in vaults, archives, banks, museums – repositories of different kinds.

I want to introduce two of these "other places" in which myself and members of the Heritage Futures team undertook research which I want to return to from time to time through the rest of this chapter. The first of these is the long-term nuclear waste and spent fuel repository site in Forsmark, Sweden, which is currently being constructed by SKB, the Swedish Nuclear Waste Management Company (Figure 2.1). And the second is the Svalbard Global Seed Vault, currently the world's largest secure seed storage facility, located on the Norwegian island of Spitsbergen near Longyearbyen in the remote Arctic Svalbard archipelago, about 1,300 kilometres (810 mi) from the North Pole (Figure 2.2). I bring them together here not only to highlight the strikingly similar physical architectures of the two repositories but also to think more broadly about the shared characteristics of such repositories which are built to contain and manage both heritage and waste.

SKB's facility at Forsmark currently includes the Final Repository for Short-Lived Radioactive Waste, SFR, as well as the facility where the Final Spent Fuel Repository for the most harmful radioactive wastes is planned. Since the mid-1980s, Swedish nuclear waste has been

FIGURE 2.1 Inside the SFR at Forsmark, Sweden

Photo: SKB.

FIGURE 2.2 The Svalbard Tube, inside the SGSV, Norway

Photo: R. Harrison.

managed and cared for at the Final Repository for Short-Lived Radioactive Waste and at the Central Interim Storage Facility for Spent Nuclear Fuel (Clab) in Oskarshamn. The planned long-term Spent Fuel Repository at Forsmark will ultimately involve the deposition of approximately 12,000 tonnes of spent nuclear fuel, which will remain radioactive and dangerous to living organisms for 100,000 years. A long ramp will descend to a depth of about 500 metres, where a system of tunnels will then be constructed in the bedrock. When fully developed – sometime in the 2080s – the repository will comprise 60 kilometres of tunnels with room for more than 6,000 copper canisters of spent nuclear fuel, packed inside bentonite casings. As each section is filled, it will be backfilled with concrete to completely encase the waste in concrete and bedrock. The total volume of space required underground in the rock will be approximately 4 cubic kilometres (SKB 2018).

In 2016, the Heritage Futures research programme ran one of a series of cross-research programme knowledge exchange workshops with SKB, which constituted a kind of extended field-based thought experiment (see further discussion in Harrison et al. 2020). What would it mean to plan for the management of the natural and cultural heritage materials and other conserved objects in the repositories in which various of our different project partners work for 100,000 years into the future? How might the management practices of archives, frozen zoos, seed and other biobanks, herbaria, historic sites, natural landscapes and museums change if we were to plan for the management of their respective conservation targets over such long durations? How would the objects of conservation themselves transform and change over those time periods? What emerged clearly from this workshop is that the futures which are planned for in heritage management are of much shorter duration – of one generation perhaps and generally little more – despite their rhetoric of fulfilling the needs of more distant futures (see also Högberg et al. 2017).

The popular understanding of the Svalbard Global Seed Vault as the "Doomsday Seed Vault" seems to echo these concerns with long-term potentially catastrophic futures. Situated on the remote island of Spitsbergen in the Norwegian Svalbard archipelago, high in the Arctic north, it received its first deposits of seeds in 2008. Nordgen, which is responsible for the day-to-day operations of the facility and maintains its public database of samples, reports that it holds approximately 933,000 "accessions" and over 50 million seeds from 234 countries and 733 depositor institutes in its frozen repository (NordGen 2016). Each accession represents an individual crop phenotype and is usually made up of approximately 500 individual seeds. The seed accessions are dried by depositing institutions to limit their moisture content to 5–6% and are then sealed inside an individual airtight aluminium bag. These bags are packed into standard-sized crates and stacked on shelving racks within one of the three separate, identical storage vaults, each measuring approximately 9.5 × 27 meters, which are refrigerated to maintain a constant temperature of –18 degrees Celsius. These vaults have been excavated approximately 120 metres into the side of a sandstone mountain at a height of 130 meters above sea level; entry to the vaults is via a 100-metre entrance tunnel. Equal parts bunker and frozen "ark", its dramatic façade includes a commissioned artwork, Perpetual Repercussion, which "renders the building visible from far off both day and night, using highly reflective stainless steel triangles of various sizes" (Government of Norway 2015). Cold climate and permafrost ensure that even if power is lost, the storage vaults would remain frozen for a significant period of time, even taking into account the possible effects of climate and sea level changes. "Designed for [a] virtually infinite lifetime", it is perceived to be "robustly secured against external hazards and climate change effects" (see further discussion in Harrison 2017).

Containment 2: ghosts, absences and unmanaged disposals

If the robust security of biobanks and nuclear waste repositories tells us something of the similarities between heritage and waste in their managed depositions in these "other places", what can we say about the absences and gaps in the landscape which are created by the gathering together of heritage and wastes and their storage in such a manner? And what happens when these affective materials leak from their repositories into the surrounding environment?

Drawing on the theme of cultural and historical debt in Derrida's *Spectres of Marx* (1994), Hetherington (2002, 2005, 2007) suggests that ghosts in the urban landscape represent the traces of unfinished or unmanaged disposal. We might think here of the obsessive conservation of the remaining traces of the Berlin Wall (Figure 2.3), for example, or of the almost fetishistic attempts to conserve the empty niche of the Great Buddha at Bamiyan in Afghanistan following its destruction by the Taliban in 2001 (see discussion of absent heritage in Harrison 2013a). Similarly, the early twenty-first century is haunted by other ghosts of unmanaged disposals, like the vast tracts of plastic wastes which converge within oceanic gyres (Figure 2.4; Morton 2013). But perhaps even more problematic and more authentically haunting are the invisible anthropogenic waste products: carbon monoxide as an artefact of agriculture and industrial processes, chemotoxic wastes within waterways, the radionuclides within the Earth's geology, which persist as atomic traces of nuclear energy production and warfare. These pollutants haunt as much because they constitute matter "out of place" (c.f. Douglas 1966), and

FIGURE 2.3 Traces of the former Berlin Wall conserved as "heritage" near Potsdamer Platz, Berlin, Germany

Photo: Aridd/CC BY-SA 4.0. https://creativecommons.org/licenses/by-sa/4.0/.

FIGURE 2.4 Plastic and rubbish floating in the ocean. Such images have themselves become a meme of the Anthropocene

as such, they help shine a light more intensely on the ways in which these repositories create new realities through their collecting and ordering practices.

Transformation, toxicity and decay

One of the complex problems which the management of nuclear and other forms of hazardous waste presents is that the materials transform themselves over time. Marcos Buser (2016) points out that certain organic pollutants are transformed into what are termed "metabolites" by bacterial or chemical decomposition, forming new materials which are often far more toxic than their parent materials. In the same vein, we might think of the half-lives of nuclear materials and the ways in which they actively decay. On the other hand, decay contributes both positively and negatively to the aesthetic values of heritage (e.g. DeSilvey 2017). The affective power of heritage sites, both positive and negative, also changes, sometimes less predictably, but transforms nonetheless (e.g. Macdonald 2013). Conservation and heritage work is often framed as a process of slowing or managing such change and decay (DeSilvey 2017).

However, it is also clear that certain heritage sites also become more or less toxic according to other contextual shifts in their social, material, political, economic or ecological environment. I've written elsewhere (Harrison 2013a) about the ways in which what might otherwise be valorised and protected as "intangible heritage" might also form templates for identifying ethnic minorities and targeting them for expulsion, violence and genocides by majoritarian groups. I draw on Arjun Appadurai's *Fear of Small Numbers* (2006), in which he considers the connection between globalisation and extreme culturally motivated ethnic violence in the genocides that occurred in the 1990s in eastern Europe, Rwanda and India and subsequently in the 2000s in what has been termed the "war on terror". Each of these arose under circumstances in which "intangible" cultural differences amongst minorities became the focus for identifying specific groups for violence and genocide. Relatedly, in *Collecting, Ordering, Governing* (Bennett et al. 2017), we have shown how the culture concept has been utilised in the forms in which it has been articulated in museum and heritage sites to form templates for articulating difference in human populations for the purposes of the application of differentiated programmes of social governance. The ways in which these programmes of differentiated social governance can be administered through liberal and illiberal governmental means can shift according to changing political contexts.

Waste and wilderness as zones of exclusion

Another area where waste studies illuminates heritage is in thinking about waste and heritage as both contained within and defined by zones of exclusion. I draw here on the work of historian of science Peter Galison (2015), who notes this resonance across waste and wilderness in his work. Both heritage and waste are articulated through practices of boundary maintenance and the selective exclusion of humans. Wilderness is defined precisely by the absence of human traces and the boundaries managed to exclude such influences. IUCN Category Ib: Wilderness Areas are defined as "Protected areas that are usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition". They are "large … untouched areas where ecosystem processes, including evolution, can continue unhindered by human(s)" and should be managed in such a way so as to limit any human visitation. But in many other less extreme ways, we see heritage as defined by its controlled access and restriction of human intervention: the ubiquitous glass case of the museum, the roped barrier which keeps visitors from private rooms in country houses, the extreme isolation of the Svalbard global seed vault, for example.

This physical and discursive distance also produces problems of communication which resonate across waste and heritage management. We have become used to the idea that the values of objects, places and practices managed as heritage are not necessarily legible to "ordinary people", that "experts" must be engaged to "interpret" the values of such places to the public (e.g. Tilden 1957). Their values are mediated by interpretive signage, by costumed guides, by maps and plans, through audio guides. Like heritage, nuclear waste management is dominated by questions relating to the development of long-term warning messages which will communicate the danger of buried nuclear waste with the life forms which will occupy and inherit this human heritage hundreds of thousands of years in the future (e.g. see US Department of Energy 2004).

FIGURE 2.5 Interpretive heritage signage at the Ongarue Spiral Trail, Oregon, USA

Photo: Johnragla/CC BY-SA 3.0. https://creativecommons.org/licenses/by-sa/3.0/.

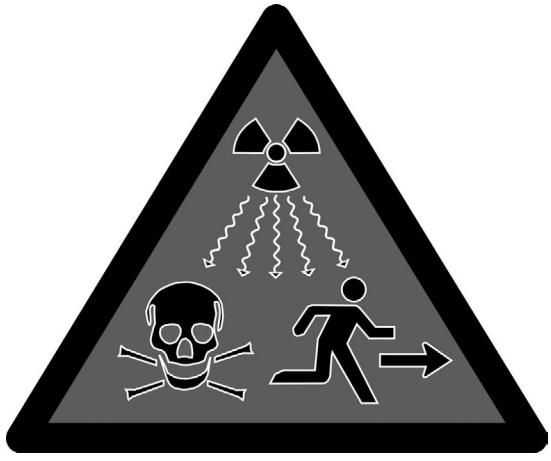

FIGURE 2.6 ISO nuclear radiation warning sign

Source: Public domain image.

Conservation, salvation and sacrifice

Another theme which emerged strongly from the empirical research we undertook within the Heritage Futures research programme is the ways in which the designation of certain forms of conservation landscape (for example, national parks and other forms of protected areas) could be argued to facilitate specific forms of environmentally damaging "non-conservation" activities outside of their borders. This is a sort of paradox in which conservation must be seen as integrally connected with and facilitative of its alter – landscape conservation emerges to compensate for practices of land degradation, biodiversity conservation compensates for practices which lead to species extinction, archival practices with the destruction of historical records and so on. This observation suggests that conservation landscapes in particular cannot be studied without looking at their broader landscape management effects – the "salvation" of certain designated areas and the "sacrifice" this facilitates for others. This invites a radical rethinking of conservation histories. We cannot understand the gazettal of protected buildings or landscapes without looking beyond the gazetted structure or reserved area to consider the negative actions which such conservation activity permits. The salvation of one endangered object could be said to be bound up with, and complicit in, the sacrifice of another (Harrison et al. 2020).

(Over)accumulation, remembering and forgetting

Returning to the Spitsbergen, the Svalbard Global Seed Vault is not a conventional seedbank but was conceived as part of a global system to facilitate the secure storage of a duplicate "backup" of seeds from national and regional repositories. These backed-up copies of seeds are stored free of charge and are held as part of an international agreement in which the seeds remain the property of the depositing institution and are available for withdrawal by the depositing institution (and only that depositing institution) at any time. It is thus not an active genebank but a literal "vault", a kind of Swiss bank containing a secure stock of duplicate seeds which can be used if seed stocks from the depositing institution become depleted or lost. The requirement for such a facility seemed to be clearly demonstrated when, in September 2015, scientists from the International Centre for Agricultural Research in Dry Areas (ICARDA) who had lost access to their genebank facility in Aleppo, Syria, requested the return of duplicate samples of seed which had been sent to the SGSV to reconstruct their collection in a new facility in Lebanon. This first withdrawal of seed samples from the SGSV as a result of the ongoing conflict in Syria was reported widely in the media and seemed to indicate clearly that the SGSV was already fulfilling a purpose which it had previously been assumed would arise in a more distant future, justifying the significant investment in this global "insurance policy". The manager of the new genebank facility in Terbol, Bekaa, was reported to have said of the withdrawal of seed samples,

> It [SGSV] was not expected to be opened for 150 or 200 years. … It would only open in the case of major crises but then we soon discovered that, with this crisis at a country level, we needed to open it.
>
> *(Alabaster 2015)*

Thus, in conjunction with ongoing processes of in situ crop diversity maintenance, themselves subject to continuing processes of natural and cultural selection which alter contemporary global crop diversity, the vault's collection reverses what is understood to be a natural entropic

process of diversity decay (but one which is accelerated by anthropogenic activity) by increasing crop genetic diversity (Harrison 2017). In this sense, the values of its collection also increase with time – we can think about the SGSV as a bank for the accumulation of biodiversity as a specific formulation of bio-capital which relates to newly emergent late capitalist bioeconomies (see also Breithoff and Harrison 2020a, 2020b; van Dooren 2007, 2009).

However, questions of over-accumulation haunt both heritage and waste too. The concrete forms which the various apparatuses which have been produced to identify and manage forms of heritage at risk – the registers which form a record of endangered species and ecosystems, the List of World Heritage in Danger and so on – often don't include processes by which these objects may be removed from such registers (Harrison 2013b). The overburdened museum store room or the domestic spaces of the cluttered attic become the emblematic symbols of these processes of over-accumulation of heritage (see Macdonald and Morgan 2017, 2018; Morgan and Macdonald 2018). The over-accumulation of "stuff", the durability of plastic wastes and their accumulation in alarming quantities in landfill, the problem of managing digital objects, e-wastes, noise and light pollution and indeed the massive growth in human population itself all speak to this same anxiety of enumerating growth in things as forms of over-accumulation.

An obsession with memory practices also cuts across these fields. I've already referred to the work in nuclear semiotics which has at its core the study of intergenerational memory practices. Andreas Huyssen (2003) points to the emergence of memory and its materialisation through memorials, museums and other cultural institution as one of the key cultural and political phenomena of late twentieth-century modernity. Derrida's *Archive Fever* (1996) discusses the obsessive replication of such memory practices across many different domains of practice. I take this term "memory practices" from Geoffrey Bowker (2005) who studies the proliferation of archival and other classificatory systems across various fields of natural science. The archive stands in complicated relation here with the future; it orders and makes new worlds in its structuring of reality (see discussion in Bennett et al. 2017).

But these acts of deposition, preservation and interpretation are as much practices of forgetting as they are of remembering, as archives are actively selected, selectively retained and impartially interpreted. These selective practices of remembering are also hierarchical practices of valuing. We are reminded here of how the sites for the deposition of chemotoxic and radioactive wastes have also been selected in ways which reflect differentiation in the value of human lives between those who benefit from the consumption of the end products from which wastes are produced and those who are forced to live amongst and are most impacted by the presence of those wastes in the environment.

On life amongst the ruins: contamination, collaboration and contagion

I want to conclude with some notes on the light which these comparisons between heritage and waste might shed on living with the legacies of both. I do so with four further keywords, collusion, contagion, contamination and collaboration. I take this bringing together of two of these four terms from Anna Tsing, who notes that

> we are contaminated by our encounters, they change who we are as we make way for others. As contamination changes world-making projects, mutual worlds, and new directions, may emerge. Everyone carries a history of contamination; purity is not an option.
> *(Tsing 2015, 27)*

and further, "Collaboration means working across difference, which leads to contamination" (Tsing 2015, 28). While I'm interested in the ways in which she develops this line of thinking in relation to concepts of diversity and difference, which are also key heritage concepts, I want to highlight the ways in which the idea of contamination by chemical and radioactive wastes might help us to look with fresh eyes at the embodied experience or affect of heritage whilst also helping us to think through the ways in which a sense of collaborating or colluding with material and discursive legacies helps us to begin to look at the possible future-making projects which are implied across these various different domains of practice.

My understanding of the potentially affective, embodied experience of heritage has perhaps emerged most strongly from my work with Aboriginal people in Australia, for whom the management of the landscape as an aspect of heritage has a direct influence on both collective social wellbeing and individual physical wellbeing (see e.g. Harrison 2004). Take this statement from a colleague (now deceased), Arthur Hooper, a senior Muruwari man (then in his 70s) and honorary national park ranger with whom I worked recording the remains of a historic Aboriginal village in northwestern NSW in 2001. He said,

> ever since I've been coming out here, doing a little bit of work for people, I've been feeling really great. I'm really happy to see the old place again. And my feelings – inside me it's a very glad feeling, I have no worries about anything else. No aches and pains, I just walk around the place for hours and hours without getting tired.
>
> *(interview, 18 November 2001)*

June Barker, his contemporary, went on to say,

> We always liked to go out to Dennawan. We'd look around there … it's hard to describe. Even yesterday I was at Dennawan and the little bit of a [house] frame is still standing there and I got a bit emotional. I don't know whether you understand it but it's within you … and then yesterday I was out there again with Arthur Hooper and we went over and he said "I think this is the place here now, this is where you fellas used to live" and when I walked and stood I said "Yes Arthur, this is the place". You don't feel that just anywhere. You only feel that in special places and Dennawan is a special place. It will always be set in your heart.
>
> *(interview, 11 April 2002)*

Here, heritage is explained as a corporeal experience, an affective, embodied, emotional coming together of people and place.

We perceive chemical and radioactive wastes as invasive, contaminating waterways, invading our bodies and transforming us in the process. What separates this sense of the affective experience of heritage is not a qualitative difference in the nature of the embodied experience or transformative power of waste and heritage but practices of categorising and valuing. The separation between the rubbish dump and the museum begins to erode in the comparison.

What does it mean to present such comparisons now, in an epoch defined by the infiltration of radionuclides into the earth's very geology, in the Anthropocene, when any sense of the separation or isolation of humans from that thing which once we called nature can no longer be maintained? In my book *Heritage: Critical Approaches* (2013a), I asked rhetorically

what it means to live amongst the ruins and spectral traces of the past, the heterogeneous piling up of historic materials in the present. And I think perhaps now I'm ready to venture an answer. Living with heritage and waste means collaborating with both, engaging thoughtfully in world-making practices which acknowledge the interconnectedness of each. The traces and residues we inherit are largely unchanged by these practices of categorising and valuing which relegate them to one or the other space but are the materials we will work with and through and which in turn will work with and through us. These traces equally constitute the legacies with which we will assemble future worlds, futures which are not predetermined but which remain open, emergent, unformed and multiple.

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