

## Care and maintenance in perpetuity? The nuclear landscape of the Blackwater Estuary

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Emerging from the Dengie Peninsula, the Blackwater Estuary in Essex crystallises complex issues around history, heritage, ecology and the geopolitics of energy production. As an estuarine landscape, the Blackwater's interrelationships are planetary. Tides ebb and flow; each winter, birds such as dark-bellied brent geese migrate around 2,500 miles from Siberia to the sucking mud of Essex shores. The chapel of St Peter-on-the-Wall sits atop the remains of a half-submerged Roman fort; in nearby Maldon, the well-known 'Maldon Salt' is panned and processed. The Estuary's involvement in the nuclear military-industrial complex rubs up against the Othona Community. Here the arrangement of humans and non-humans, historical sites and important ecologies, demands consideration, particularly when thinking about and acting on the planning and implementation of the infrastructure of nuclear power production, decommissioning and waste storage.

The context for our co-authored contribution to this volume is our shared academic and pragmatic interest in place-specific art practice and the Blackwater Estuary. Writing as an artist (Simensky) and as a curator (Harper), we consider how the development of place-specific curatorial and artistic methods 'in the field' enables new ways of highlighting current discourses around the nuclear in the region, and the multiplicities of actors and legacies that both run through and inhabit the estuary; Anna Tsing reminds us that 'to listen to and tell a rush of stories is a *method*'.<sup>1</sup>

Throughout this chapter, we will draw on our experience of living and working in Essex and the Blackwater Estuary, as well as on current artistic and curatorial approaches to place and heritage. Although these approaches are not all situated within the Blackwater Estuary itself, they nevertheless shed light on this specific context, to suggest how new artistic and curatorial methods might be developed 'in the field'. We will do this through the consideration of two distinct sections, each of which deploys a specific theoretical device. First, 'Time and Measurement' uses the concept of the *interscalar* to address the varied scales and durations at play within the Estuary and examines how interscalar objects can 'bear witness'. Second, we will respond to the nuclear industry term 'Care and Maintenance' in order to reflect upon how the Othona Community challenges the norms of industrial energy production and ideas of 'care' and custodianship to provide a critical reconsideration of 'heritage' in a time of ecological crisis. Throughout this we will interweave artworks and research projects by international artists who actively articulate the potential of more-than-human perspectives on care, stewardship, temporality, conservation and critical heritage.

## Time and measurement

As a product of the dismantling of Bradwell A in 2083, waste materials – including 4,000m<sup>2</sup> of graphite and sludge from the treatment of radioactive liquid effluents – will join a store of existing low- and intermediate-level waste adjacent to the power station.<sup>2</sup> The graphite currently lies in passive containment within the aluminium-clad reactor buildings, forming the reactor cores from which all fuel rods have been removed. These graphite blocks and their components might be thought to act as a 'material witness' to both the role Bradwell A played in the emerging nuclear energy regime of the 1950s and '60s and the changing face of the Estuary. Artist researcher Susan Schuppli describes the concept of the 'material witnesses' as:

nonhuman entities and machinic ecologies that archive their complex interactions with the world, producing ontological transformations and informatic dispositions that can be forensically decoded and reassembled back into a history. *Material witnesses* operate as double agents: harboring direct evidence of events as well as providing circumstantial evidence of the interlocutory methods and epistemic frameworks whereby such matter comes to

be consequential. *Material witness* is, in effect, a Möbius-like concept that continually twists between divulging ‘evidence of the event’ and exposing the ‘event of evidence’.<sup>3</sup>

This notion of materials as bearing witness to the events that shape the materials’ existence is a productive point of departure. As an example of ‘material witness’ Schuppli highlights the discovery of radioactive contamination that came from Japan’s Fukushima Daiichi nuclear disaster on the shores of Canada five years later. The radioactive signature, which is unique to the accident, made clear the source of the contamination. Taking Schuppli’s example as a provocation, we have begun thinking through and speculatively tracing the journeys and stories contained within layers of graphite stored in Bradwell A.

The irradiated graphite in Bradwell A can be used as an anchor and conceptual device to propose an ‘interscalar’ approach to analysis. In this context, the graphite bears the evidence of the event of nuclear power production in Essex as well as the technologies and materials that made Bradwell A possible. The graphite also enables us to think through this process, to consider the varied and simultaneous timescales and geographic locations at play, as well as their geopolitical implications on this stretch of Essex’s coast. For Gabrielle Hecht, contemplating the notion of a specifically African Anthropocene, interscalar vehicles are ‘objects and modes of analysis that permit scholars and their subjects to move simultaneously through deep time and human time, through geological space and political space’.<sup>4</sup> The notion of the ‘interscalar vehicle’ permits us to think about the Estuary and its relations, traversing large swathes of the Earth, while maintaining disparate localities and temporalities within the same conceptual frame. A case in point is the deep time of uranium extracted from countries across the world, such as Australia, which has one of the world’s richest deposits, with up to 3,500 tonnes being supplied to the Europe annually, including to the UK.<sup>5</sup> With this in mind, it does not take a leap in imagination to conclude that the mines of Australia provided some uranium for the reactors of Bradwell A, the very same reactors whose radioactive residue still sits with and emanates from the graphite blocks encased on the Blackwater’s coast today.

Hecht also proposes the ‘interscalar’ to consider how scholars (and by extension, artists and curators) might build on the various critiques that have been levelled at the proposition of the Anthropocene as a new epoch, in order to acknowledge and unpack its violently uneven distribution and effects.<sup>6</sup> Hecht argues it is important to understand both that the Anthropocene and its critiques are themselves scalar projects,

and that scale can be utilised not just to evoke intimacy and interrelations but also to alienate, discriminate and individuate. With this in mind, Hecht asks how one might use empirical objects as ‘interscalar vehicles’ in order to connect scales and stories usually kept apart.<sup>7</sup>

Throughout her analysis, Hecht employs uranium-bearing rocks as an interscalar vehicle to engage and incorporate the complexity of the Anthropocene and its politics. Hecht uses these rocks to traverse time and space: from Gabon (in this instance, the location where the uranium was originally mined, and where research has been conducted into the geologic storage of radioactive waste) to France (whose colonial presence and legacy is still felt in the region today). Thus, the interscalar embodies a way to think using matter that bears witness – where time and locality leave their mark – bringing together a rush of apparently disparate but interrelated stories.

The interscalar as a device within art has also been touched upon by Susan Schuppli.<sup>8</sup> She draws on artist and film-maker Harun Farocki’s 1969 film *Inextinguishable Fire*, discussing a particular scene where Farocki is seated at a table facing the camera. Farocki reads out testimonies from the Russell Tribunal, describing military violence, chemical warfare and the use of napalm during the Vietnam War.<sup>9</sup> In the film, Farocki aims to present a representation to the viewer that can testify to the extreme heat of a napalm attack, in such a way that does not encourage the viewer to look away or avert their gaze from the screen. Schuppli argues that to do this the artist employs an interscalar device by putting out a lit cigarette on his own forearm in order to convey in some relatable way the intensity of the extreme heat and devastating effects of napalm. Before burning his arm Farocki tells the viewer:

if we show you pictures of napalm burns, you’ll close your eyes. First you’ll close your eyes to the pictures. Then you’ll close your eyes to the memory. Then you’ll close your eyes to the facts. Then you’ll close your eyes to the entire context. If we show a person with napalm burns, we will hurt your feelings. If we hurt your feelings you’ll feel as if we’d tried napalm out on you, at your expense. We can give you only a hint of an idea of how napalm works.<sup>10</sup>

As Farocki stubs the cigarette out on his arm, a voiceover explains to the viewer that ‘a cigarette burns at 400°C. Napalm burns at 3000°C.’ As one sees the cigarette hit and burn the flesh of Farocki’s arm, the viewer is confronted by the almost eight-fold increase of heat one would have to endure if subjected to napalm. In this moment, the viewer experiences an

interscalar shift that propels them to consider the overwhelming ordeal and incredible suffering of a napalm attack.

Schuppli articulates how art can bridge the gap between seemingly incommensurable realities such as between the temperature of napalm and the burning embers of a cigarette, and between chemical weapons and their ethical, moral and legal implications on far-flung geographical locations. Likewise between a radioactive rock from one continent and its transformation into fuel and use in another continent, with all the political, ethical, geological and environmental implications this entails.<sup>11</sup> The interscalar embraces complexity and contradiction. Incommensurate realities are held within the same conceptual frame, whether this is experiential (heat) or geographical (disparate locations geopolitically implicated). In both of the aforementioned instances the objects in question are stand-ins, ways to articulate entangled and complex relations.

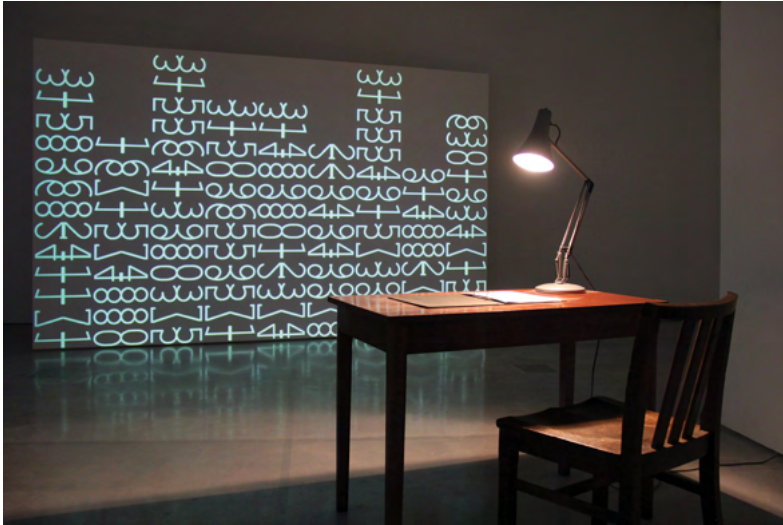
In 2002 the decommissioning process began at Bradwell A, and in 2018 the power station entered an eighty-year 'care and maintenance' phase. During this period, an aluminium weather envelope encases and seals the exterior of the site's two reactor buildings until the radioactivity of the infrastructure is sufficiently decayed, at which point the site can be cleared. The graphite sits within the reactor building's aluminium jacket silently emanating the radioactive residues from the uranium rods it housed during Bradwell A's production of nuclear-powered electricity. The graphite used in Bradwell, like other UK Magnox reactors, is a synthetic graphite called Pile Grade A (PGA). PGA was developed in 1950 and is a coarse-grained, impregnated graphite originally manufactured by British Acheson Electrodes Limited and then by Anglo-Great Lakes Limited.<sup>12</sup> The raw materials are filler coke, binder and impregnant. The filler material would have come from petroleum coke from Shell Oil since this had a high degree of crystallinity and purity; however, there may have been some variation in coke due to the prevailing situation in the oil industry. The binder was acquired from North Thames Gas Board and was a 'low ash' pitch manufactured from Ford's coal tar. The impregnant was from a different source, thought to be the Shell Chemical Corporation as this was probably the cheapest suitable impregnant at the time. This demonstrates how it is not only uranium that implicates Bradwell within the geopolitics of industry; if this analysis is applied to other materials and processes within the construction of the nuclear industry's infrastructure, from concrete to glass, links to the extraction and exploitation of places beyond the estuary come into focus.

While it will be at least another 63 years before the graphite is uncoupled from the architecture of the reactor, the depleted uranium

rods have already been transported to Sellafield, in Cumbria, in purpose-built storage casks along with other high-level waste. Once at Sellafield, the rods are vitrified in glass to improve stability. The graphite bears witness not only to the neighbouring radioactive rods, but also to the broader infrastructures of nuclear power production, including the mines from which the uranium was extracted. Throughout the next 63 years, the Blackwater Estuary is set to change irrevocably as a result of the impact of climate change and also, should the proposed plans come to fruition, a new nuclear power station. How might one consider the radiological events the graphite has witnessed whilst within the reactor? How might one envision the changes set to occur around the reactor buildings in the years to come? These events comprise an integral part of the UK's nuclear power production, implicating human and non-human others, both within the region and beyond. Artworks that demonstrate the ways contemporary art practice can be rich, complex and interdisciplinary, developing interscalar approaches, can help answer these questions. In sharing selected examples we seek to demonstrate how such a methodology used within contemporary art can point back and connect to the material culture and specific context of the Estuary. Objects such as the graphite within the reactor buildings are elements of the Estuary's material culture, in a way that is inextricably linked to the landscape while being inaccessible and dangerous to the very surroundings in which it sits.

Artists use various approaches to explore protracted stretches of time, articulate ideas and develop new forms of production that make tangible the scales that operate well beyond the parameters of human life. The place-specific artwork *Temporary Index*, by artists Thomson & Craighead, takes the form of a series of nuclear site markers proposed for nuclear sites and waste storage facilities across the world; these totems signpost to places such as underground disposal facilities while simultaneously counting down the length of time in seconds until the waste in question will become safe for humans (Figure 14.1). The work can be exhibited as a series of counters for multiple sites or as stand-alone totems pointing to nearby radioactive locations counting down second by second the slow half-life decay of the radioactive isotopes they represent.

As part of this ongoing series, Thomson & Craighead were commissioned by Ele Carpenter in partnership with Arts Catalyst to make a physical counter for the Nucleus Archive in Wick, Scotland. The focus of the artwork is Dounreay, situated around 30 miles from the Nucleus Archive, where a counter will tick for approximately 312 years – the length of time the radioactive waste must be stored and isolated from the



**Figure 14.1** Thomson & Craighead, *Temporary Index*, 2016. Digital projection, live information. Image provided courtesy of the artists.

biosphere. This artwork demonstrates how humans measure time through both linguistic and pictorial language, raising pertinent questions about the longevity and effectiveness of human forms of communication, one straightforward but perplexing question being how one might even begin the process of communicating effectively over millennia. Through this process the work seeks to highlight the considerable lengths of time radioactive waste traverses as well as the inter-generational project that confronts humans in terms of its safe storage.<sup>13</sup> For example, it will be at least until the end of the century before the area on the estuary around Bradwell A is opened up to alternative use. Additionally, waste will be stored on site for the foreseeable future if Bradwell B comes to fruition by the late 2030s. When factoring in cooling periods for radioactive waste and the incredibly optimistic projection of a functioning geologic disposal facility in the UK by 2040, waste could be on the Estuary until around 2150, and possibly beyond that. Therefore, if Thomson & Craighead were to produce a counter for the Blackwater Estuary, this could begin at a conservative 130 years, or 4,099,680,000 seconds. If the waste is not removed elsewhere, or if Bradwell B materialises, then this length of time will grow significantly.

The chapel and its predecessor, the Othona fort, however, offer different insights into the chronology of the Estuary, one that looks

back rather than forward and raises different questions around time, its measurement and how humans might observe it in different ways. It was in 664, shortly after the chapel's construction, that the founding bishop of the chapel, Cedd, participated in a significant moment in the history of Christianity in Britain: the Synod of Whitby.<sup>14</sup> The Synod established when in the Christian calendar Easter should fall. The impact of preferring the Roman date over the 'Celtic', which caused deep-seated division in the Northumbrian church, highlights the fact that the method of measuring 'time' is often contested and contingent on prevailing ideologies at a given moment.<sup>15</sup>

Examining a specific place through the interscalar – both in terms of material culture and artistic production – it is possible to consider the social, political and geologic implications of different modes of periodisation ascribed to the Estuary: cyclical, recursive and finite. These range from the deep time of uranium deposits and their associated colonial legacies, to the extended timeframes of nuclear energy storage, from radioactive half-lives to the human lifespan of engineers, from the remains of Saxon fish weirs, ongoing fish-breeding and bird migration, to the 'feral' effects of nuclear power production.<sup>16</sup> 'Feral' here describes a situation in which an entity, nurtured and transformed by a human-made infrastructural project, assumes a trajectory beyond human control. Wrapped up in these modes of periodisation are disparate locations, objects, organisms and ecosystems understood across varying scales, which may be complementary or inimical to one another. This reminds us that the movement through scales that the interscalar may facilitate within artistic, curatorial and scholarly work is not necessarily applicable to the specificities of those that inhabit or are implicated within a particular context. The movement through scales should not be fetishised as a frictionless endeavour. The abrasive consequences of these shifts should be examined and understood both in theory and practice, with consideration given to how such movements might not even be possible or desirable; uranium-bearing rocks might allow one to think through time and space, but this should not discount the trauma and damage wrought by the rocks' removal.

The Blackwater Estuary is characterised by saltmarshes and low-lying reclaimed land and is therefore one of the areas that will be impacted by rising sea levels as a result of climate change.<sup>17</sup> This is one of the reasons why the proposed new development of Bradwell B will situate its reactor buildings on islands elevated several metres above the ground. Climate Central, an independent organisation of leading scientists and journalists, predict that by 2050 much of the world's current coastline will



be underwater or see increased instances of flooding.<sup>18</sup> This will create new coastal cartographies along the way. When coupled with further inter-generational problems such as nuclear waste storage, the graphite blocks are set to experience two Anthropocenic conflicts, where humans vacillate between waste storage solutions and mitigating risk against rising sea levels. While the graphite blocks at Bradwell A remain enclosed within their aluminium jackets, the estuary outside will face a multitude of changes which will have significant consequences. Such consequences will have lasting effects across deep time, in ways that humans find difficult to measure or easily understand. Many characteristics of nuclear superstructure and management are seemingly unremarkable, like the movement of waste from nuclear site to nuclear site or the passive observation of a decommissioned power station's buildings until they can be dismantled safely. This is the everyday reality of nuclear landscapes that have not succumbed to spectacular disaster. How can contemporary art and curatorial practice make tangible the everyday 'slow violence' of 'nuclearity' characterised by the decommissioning process of a power station, or the labour practices of uranium extraction and other forms of nuclear activity without explicit reference to the spectacular violence of events like Hiroshima, Chernobyl or Fukushima?<sup>19</sup>

## Care and maintenance

Fragmented bathymetry surveys, speculative marine archaeology and the unexpected retrieval of objects from the early Holocene period show how the Essex coast 10,000 years ago would be unrecognisable to us today.<sup>20</sup> Large mammalian remains, bone tools and fossilised vegetation dragged into the present by North Sea fishing trawlers provide evidence not only of historic human habitation on Doggerland – a tidal landmass connecting what is currently the UK and Netherlands – but a reminder of low countries' vulnerability to rising sea levels. The coverage and quality of Essex saltmarshes and Bradwell Shell Bank has been declining due to development and an increase in the frequency of storms in recent years with 1,000ha of saltmarsh lost over a 25-year period. The remarkably changeable configuration and composition of the estuarine landscape provides a rich context to consider the impacts that ongoing – and increasingly unpredictable – sea levels and weather have on the often contested interests and relations of human and non-humans. The chapel no longer sits on a peninsula flanked by the sea.<sup>21</sup> Instead of red hills, marsh and grazing sheep, a panorama of alfalfa, winter wheat, yellow

oilseed rape and sugar beet fields stretches out, accompanied by the occasional dull thud of munitions testing on Foulness Island some 15 miles away as the crow flies. Industrial production has transformed local populations and labour relations. Looking east from the sea wall, it is possible to see container ships, cruise liners, fishing trawlers and the 48 turbines of Gunfleet Sands offshore wind farm, around 4 miles from Clacton-on-Sea. Turning 180 degrees to face west, North Sea to your back, the aluminium-clad reactors of Bradwell A loom on the horizon. The growth of nuclear energy can be understood as intimately connected with modernist ideas of progress. Resource-thirsty infrastructures and energy can neither be uncoupled from the current climate crisis nor historically and materially isolated from the growth of capitalist modes of production and market-driven economic policy.<sup>22</sup>

The term 'care and maintenance' is a nuclear industry-specific term, to describe the interim period after both of Bradwell A's reactor buildings have been defuelled, decommissioned and covered in weatherproof cladding to create 'safestores' – with all intermediate-level waste packaged for storage on site – and before the remaining structure is dismantled. 'Care and maintenance' serves to foreground the constant attention and monitoring nuclear sites require even in this 'dormant' phase. If Bradwell B comes to fruition, the Blackwater Estuary will be legally, ethically and materially bound to host the nuclear industrial complex in perpetuity, along with the ongoing care and maintenance this entails across future generations. The anthropologist Joseph Masco tells us that 'the bomb is now a multigenerational, national-cultural, economic and environmental mutation, one that has already colonized a deep future',<sup>23</sup> and much the same might be said about nuclear power production. This sentiment is reiterated by Maria Puig de la Bellacasa, who reminds us that to *care* for something is inevitably to create relations.<sup>24</sup> The ongoing care and sustained maintenance of nuclear power and its radioactive residues will need to be maintained for millennia, requiring a present-future-oriented perspective to the relations this creates and how those will change.<sup>25</sup>

While over 60,000 tons of spent nuclear fuel are stored across sites in Europe,<sup>26</sup> these storage sites are not long-term repositories. Unlike the world's first permanent geologic storage facility, Onkalo in Finland, or the proposed and much-contested Yucca Mountain site in the United States, these are merely halfway houses, places where the waste is waiting for its final storage location.<sup>27</sup> Sellafield holds one of the largest inventories of untreated waste, including material from Bradwell A and a stockpile of 140 tonnes of plutonium. Sellafield is also home to the UK's only storage pond for Advanced Gas-cooled Reactor (AGR) fuel, Magnox Swarf Storage

Silos and First-Generation Magnox Storage Pond; now decommissioned, these infrastructures require constant monitoring and security.

*Spruce Time*, a living artwork by artists Goldin+Senneby, selected from a proposal for a public hospital commission in Malmö, Sweden, is one way of considering the relations of care and maintenance (Figure 14.2). Goldin+Senneby use grafting to create a clone of what is purportedly the oldest tree in the world – ‘Old Tjikko’, a windswept spruce on Fulufjäll mountain in Dalarna, central Sweden, 400 miles north of Malmö. Researchers have been able to date elements of the tree’s root system to at least 9,550 years ago, suggesting it was a sapling during the Ice Age at the start of the Holocene period, 11,700 years ago. The artwork began as soon as the cloning process started in 2019, and from 2025 staff, patients and visitors to the hospital will be able to see the tree inside a custom ‘care building’, described by Goldin+Senneby as ‘a computer-controlled greenhouse attached to the hospital’s existing cooling system, where the needs of the tree determine the climate. The greenhouse becomes a customized miniature hospital responsible for the care of this single tree.’<sup>28</sup>

The work is interscalar, conceptually and materially, cutting across geological epochs and the human time of people living in Sweden, to explore varied forms of dependency: technological, economic, human health and planetary. The artwork functions as a time machine drawing on Old Tjikko and the young clone as witness(es) to ongoing and extreme



**Figure 14.2** Goldin+Senneby, *Spruce Time*. Henrik Lund Jørgensen/Region Skåne.

climatic changes through which humans and non-humans experience epidemics, starvation and global climate crises. The more extreme global warming becomes, the more the location of the tree in Malmö will contrast with the climate the spruce has experienced on Fulufjäll mountain.

The ambition for *Spruce Time* is that the tree should live for as long as possible – potentially for ever. *Spruce Time* succeeds in going beyond the diagnostic; rather than operating as a diagram or metaphor, the artwork creates new relations that will inevitably shift over time, whether through climatic, social or political pressure and change. Making the world's oldest tree dependent on a hospital and making the hospital's air-conditioning infrastructure part of the tree's ecology as an artwork raise interesting and necessary points of friction. The act of relocating the sapling from an environment that has sustained the tree from which it originated for millennia to a site that requires constant human and technological intervention to ensure the tree's survival troubles several concerns that resonate with the future-oriented nature of heritage practices.<sup>29</sup> In the case of *Spruce Time* these include: the uneven economic stability to sustain a public healthcare system and, in this instance, the infrastructure of the tree, over a prolonged period; the varied forms of human labour and social reproduction necessarily involved in care; and the normative violence of healthcare through the definition of what is biologically healthy, sick or desirable.

Ele Carpenter suggests there has been a shift of responsibility for nuclear storage onto the public sector, and that this in turn would suggest a concern for public health.<sup>30</sup> We can see how works like *Spruce Time* can raise questions about the conditions necessary for ongoing care and maintenance, what such a continuing process might look like and who and what will inherit this responsibility and in what circumstances. Any multigenerational project, whether that is the indefinite care and maintenance of a tree or the safe storage of nuclear waste over millennia, needs mitigating measures in place to ensure such tending is possible. How does one decide on and implement such long-term structures of care and maintenance? How is this continuing process governed in order to safeguard against decisions detrimental to the conditions necessary for commitments extending seemingly infinitely into the future? Answering questions like these becomes increasingly difficult when projecting tens of thousands of years into the future. Inevitable gaps in human understanding of events and activities just a few thousand years in the past only reiterate this.

The Dengie Peninsula is home to rare native oysters and oyster beds that host life support systems for a wide range of diverse species and has been awarded multiple national and international designations: a Marine Conservation Zone, Site of Special and Scientific Interest (SSSI) in 1993,

Recognised Wetland of International Importance (Ramsar) in 1992, Special Protection Area for vulnerable and migratory birds (SPA) and Special Area of Conservation (SAC). These legal designations, highlighting biological diversity and scientific significance, should, in theory, offer some protection during proposed developments. Essex Wildlife Trust volunteers and conservationists have been engaged in maintaining and restoring Essex saltmarsh since the late 1970s to build and preserve critical ecosystems. These include carbon sequestration, bird breeding grounds and fish nurseries of bass and gobies.<sup>31</sup> The open landscape of reedbeds, coastal farmland, shale banks, saltmarsh and mudflats sustains important and much-loved bird species, including waders and wildfowl. Golden and grey plovers, yellow wagtails, curlews, wigeon, knots and bar-tailed godwits are joined in autumn by raucous dark-bellied brent geese. These iconic birds, anticipated by local residents, overwinter in the fields and mudflats, eating eelgrass and winter cereals after their long annual migration across northern Europe from their breeding grounds in Siberia. During winter, it is also possible to glimpse raptors such as hen and marsh harriers, and short-eared owls quartering the grass. Corn bunting can be heard in the wheat and barley, while warblers and shy bearded tits inhabit the borrow dyke. Peregrine falcons nest in boxes atop Bradwell A's cladding, having previously made the reactors their home when the power station still hummed day and night.<sup>32</sup> Water and land are contested from all sides. Both the RSPB and Essex Wildlife Trust issued statements in 2020, in response to the Bradwell B consultation, expressing serious concerns that both migrating and non-migrating species, including shore-nesting birds such as little terns and ringed plovers, will be threatened by the construction and collateral impact of the proposed new nuclear development.<sup>33</sup> What is at stake here goes beyond the immediate threat of large-scale industrial construction. The proposition of a new nuclear plant throws into relief very concrete and unevenly distributed pressures, including energy consumption, access to resources and freedom of movement, severe weather and food sovereignty. These frictions are felt on local, bioregional and intimately personal scales, as well as across collective and social, national-governmental and planetary registers.

In addition to non-human biodiversity and resilience, saltmarshes provide 'soft' solutions to ecosystem preservation, reducing flood risk and the effects of storm surges.<sup>34</sup> Thames lighters have been sunk offshore in an attempt to maintain the saltmarsh, as it is squeezed between the sea wall and the eroding force of the tide. The spectre of Doggerland and the relatively recent storms and severe flooding of 1953 are testament to an unavoidable managed retreat from the sea that will be necessary in coming years.<sup>35</sup> Retreat is not without conflict; South Essex and Suffolk

Shoreline Management is tasked with deciding which areas of the coast, including farmland and even residential areas, may undergo a controlled breach, by opening the sea wall to relieve pressure and reduce the flood risk elsewhere.<sup>36</sup> It is not unusual for areas of land to be compulsorily purchased or, in the case of Foulness Island, annexed by the military. Military research and projects deemed of ‘national importance’ are prioritised over civic and local authority planning.<sup>37</sup> Bradwell A and the proposal for Bradwell B further complicates this, since the entire site must be protected against sea level rise during all the phases of its operating life and ultimate decommission. The proposal to provide long-term nuclear waste storage at Bradwell requires mitigation against the same threats, stretching even further into the future, and yet controlled retreat inland is a common understanding of midterm shoreline management. On a coast along which sea levels are rising, and which from time to time experiences destructive winds and tides, protection by reinforcing walls is only afforded to urban settlements and valuable or problematic structures, such as the now-redundant Bradwell A power station.

Over the last two decades the language of nuclear industry management has shifted to focus on ‘conservation’. Ele Carpenter describes how the nuclear industry’s responsibility towards its products is shifting from a ‘centralised’ state entwined with military interests to private ‘decentralised’ energy companies and, finally, to a ‘distributed public’ responsible for waste monitoring.<sup>38</sup> As such, the intergenerational challenge of energy dependency and waste disposal could be considered in terms of an uneasy heritage. This toxic inheritance, however, is very different from what might be more orthodoxly considered ‘heritage’. In the context of the Blackwater Estuary, heritage is a term that brings to mind the Grade I listed chapel of St Peter-on-the-Wall. The chapel is part of an inheritance of both the Christian conversion of the seventh-century East Saxon population and subsequent millennia of changing land use, property relations, governance, religion and industry.<sup>39</sup> In more recent history the Blackwater Estuary provided a frontier for the expansion of the nuclear energy industry, as a preferred location for the development of Bradwell A.<sup>40</sup> However when we consider the 100,000 years required to store high-level nuclear waste until it is safe, heritage takes on an uncertain and obligatory context – spatially, temporally and ethically. Issues of dependency, climate change, communication, significant threat to, and preservation of, life collide with the idea of heritage as something chosen, celebrated and gifted to future generations. The latter is often bound up with tourism, ideas of national identity, memory and a type of heritage primarily about preventing loss, as though the past is ‘gone’ and has no active relation or agency in the present

or future.<sup>41</sup> Beth Whalley's chapter in this volume articulates the issues of considering heritage only in terms of the commemorative and the very real impact this has on local politics and identity formation in the present. Currently UNESCO defines heritage as human legacy from the past and what we pass on to future generations.<sup>42</sup> Though this importantly includes sites considered 'dark' heritage, such as the Bikini Atoll nuclear test site and the Hiroshima Peace Memorial (Genbaku Dome), the definition fails to acknowledge the lasting implications of waste as part of the nuclear legacy and very much something we live with now and that future generations will live with, whether they want to or not.<sup>43</sup> Pétursdóttir proposes the terms 'unruly' and 'sticky' heritage to articulate the consequences of living with material legacies that are persistent, leaky and hard to contain both conceptually and physically.<sup>44</sup>

Artist Inas Halabi's single-screen video *WE HAVE ALWAYS KNOWN THE WIND'S DIRECTION* is a two-pronged inquiry, in which the deadly and invisible isotope Caesium 137 is engaged as a vehicle to simultaneously probe the purported illegal burial of nuclear waste on sites in the south of the West Bank and to render visible the systemic and uneven networks of power and control in the region (Figure 14.3).<sup>45</sup> Combining fragmented footage of the West Bank with performed conversation and interviews



**Figure 14.3** Inas Halabi, *WE HAVE ALWAYS KNOWN THE WIND'S DIRECTION*, 2019–2020. Image provided courtesy of the artist.



with collaborator and physicist Khalil Thabayneh, the film engages nuclear aesthetics by drawing on both scientific discourse and lived, situated knowledge. As an isotope, Caesium 137 represents an example of ‘material witness’, bringing us closer to what Schuppli describes as not only the ‘evidence of event’ but also ‘the event of evidence’.<sup>46</sup> Within the film Thabayneh and Halabi discuss using colour gel filters to indicate the level of Caesium or Strontium that Thabayneh and his team have measured in soil samples at different locations. The narrative is recounted as a dream by Thabayneh, recalling a village whose inhabitants knew that radiation was dangerous because, while they could not see it, they understood the cumulative effects. In order to ‘see’ the danger the villagers found a way to dye Caesium 137 and Strontium. The result is a landscape saturated in warm hues of orange to red, the narrator of the dream lamenting that this only serves to remind the villagers that they are going to die. In this way, Halabi uses film-making to account for the unfilmable. Caesium 137 and Strontium for Halabi allow the slowness of geological time to rupture into the present with a disorienting effect, causing us to speculate on uncertain futures. The result is much like Jeffrey Jerome Cohen’s observation of stone which, ‘conveying within its materiality the thickness of time ... triggers the vertigo of inhuman scale’.<sup>47</sup> *We Have Always Known the Wind’s Direction* engages with the sticky heritage of nuclear waste and not only articulates a specific historic and ongoing violence but also challenges the notion of ‘contemporary art’ as only concerning the here and now to create a present-future temporal position from which individual and collective action can be realised.

Located specifically in Essex, *How to Make a Bomb* is a durational project by artist Gabriella Hirst centred around the propagation and distribution of a nearly extinct rose, *Rosa floribunda* ‘Atom Bomb’, or the ‘Atom Bomb’ rose, created and registered by rose breeder Reimer Kordes in 1953 (Figure 14.4).<sup>48</sup> Working with the Old Waterworks in Southend-on-Sea, Hirst plans to bring the plant back into circulation within UK gardens and places associated with the legacy of the nuclear military-industrial complex.<sup>49</sup> Katherine Lawless describes how the ‘banality’ of processes like nuclear storage, disposal and clean-up are eclipsed by the spectacle of atrocity, while narratives of technological progress are often deployed to mask the ecologically unequal exchange that takes place through the extraction, labour and production of technologies – from which ‘clean/green’ nuclear is not exempt.<sup>50</sup> Spills, meltdowns and nuclear tests are visual representations of nuclear heritage, which, however, fail to acknowledge the slow violence of contemporary energy regimes – including climate change and the new global enclosures – which





**Figure 14.4** *Rosa floribunda* 'Atom Bomb' displayed in Gabriella Hirst's *An English Garden*, 2021. Anna Lukala.

are persistent and not recognised enough within the legacy of nuclear power. *How to Make a Bomb* seeks to make visible these persistent nuclear and military legacies as well as challenging colonial narratives.

The Old Waterworks is near the former Atomic Weapons Research Establishment (AWRE) on Foulness Island, an important part of Britain's nuclear legacy. It was here, in a building called 'X6', that the assembly of the high explosive elements of Britain's first atomic bomb took place, after which the bomb travelled to Australia to be detonated on the Monte Bello Islands in 1952 in a process named *Operation Hurricane*.<sup>51</sup> This marked the beginning of a devastating nuclear testing programme on unceded Indigenous lands across Australia at Emu Field and Maralinga from 1953 to 1963. To this day the Maralinga site forms part of the Woomera Prohibited Area (WPA), which is nearly the size of England. There are several Aboriginal peoples whose land the WPA encompasses: the Maralinga Tjarutja; Anangu Pitjantjatjara Yunkunytjatjara; Antakirinja Matu-Yankunytjatjara; Arabana; Gawler Ranges; and Kokatha.

The rose is the protagonist of a larger project where the artist explores the contradictions in the process of gardening: the care, manipulation and violence inherent within the relationship between plants and humans. The slow process of tending to the roses creates a space for those involved to reflect on historical and ongoing nuclear colonialism, as well as the colonial history of botany and the naming of

plants.<sup>52</sup> The gradual redistribution of the 'Atom Bomb' roses and the investment in this are a sobering way to be mindful of the devastating effects of Essex's and, by extension, Britain's nuclear legacy, reclaiming agency against Cold War revivalist fearmongering.<sup>53</sup>

With the right conditions the 'Atom Bomb' rose can live for many years. The ability to meet these conditions highlights challenges for individual carers or host institutions to keep the roses alive. The 'Atom Bomb' rose, redeployed by Hirst in this way as an artwork, can be understood as an interscalar vehicle to conceptually explore global power structures enacted through horticulture, the deep time of the nuclear and the impact of nuclear colonialism.<sup>54</sup>

There have been moments of concern for the land, and Bradwell's involvement with Britain's nuclear legacy. During the 1980s, successful protests prevented proposals for nuclear waste to be stored just below ground level on-site at Bradwell from being realised.<sup>55</sup> However, these historic objections seem to have not been taken up again with regard to the current storage arrangement adjacent to Bradwell A in quite the same way. Not only is the Blackwater Estuary an actual repository for nuclear waste, but all aspects of the nuclear fuel cycle in both the military and civil contexts are implicated within the extraction of matter globally. Alf Hornborg argues that modern and nascent technology is built on the appropriation of labour and land from the peripheries.<sup>56</sup> Bradwell is no different – from the global extraction of uranium in Australia, Canada, the Democratic Republic of the Congo and Namibia, which supply uranium to UK power stations, to the storage of Intermediate Level Radioactive Waste from Dungeness and Sizewell and the 2016 tender for Chinese corporate investment by China General Nuclear (CGN – formerly China Guangdong Nuclear Power Group) in partnership with Électricité de France (EdF), to enter the consultation phase of Bradwell B.<sup>57</sup> The UK's military and civil nuclear industrial complex has effected vast changes to other places and produced considerable waste in the form of mine tailings and other by-products, while impacting people, their communities and the environment. While the effects of the global nuclear industry are seemingly totalising and homogenising, it is crucial to recognise that at the many varied stages of the nuclear cycle these are not evenly distributed. They manifest differently in distinct regions, economies and populations. In order to critique this uneven distribution and slow violence in all its temporal complexity, it is necessary to take up the histories and conditions that generated them, both the visible and invisible. Halabi's work offers an insight into how some artists work against what academic Kathryn Yusoff describes as the universalising effect of Anthropocene discourse.<sup>58</sup>

This universalism obfuscates how exclusionary practices of colonial and capitalist expansion and accumulation are fundamental to current energy and environmental crises and therefore also need to be considered in relation to heritage and the planning and implementation of future governance and infrastructure.<sup>59</sup>

Returning to the Blackwater Estuary, it is possible to see the legacy of collective care and political action engendered by the East London labour movement and Christian socialism in the ongoing work of the Othona Community. The Othona Community, founded by Norman Motley in 1946 as an experiment in 'Christian community', originated in the transformative politics that emerged in response to the violence and exploitation of war and its exacerbating effects of social and ideological divides.<sup>60</sup> After organising 'Answer Back' groups as a chaplain during the war, Motley saw Othona as an open place where discussion about peace and reconciliation was encouraged in order to question how to bring about positive change in the post-war era. Othona was preceded by several communitarian and 'back to the land' movements, in Essex as well as more broadly within the UK, that shared sentiments with the Diggers and Levellers of the seventeenth century.<sup>61</sup> Some of the settlements of the twentieth century, including Frating Hall Farm, near Colchester, provided agricultural and construction training for conscientious objectors and pacifists.<sup>62</sup> Others sought to find new ways of living altogether, such as the communist Purleigh Brotherhood Colony, which lasted from 1896 to 1903 and which, despite being a short-lived experiment, inspired subsequent socialist, feminist and radical publishing movements.

Today the community at Othona is varied and open. The community are regular users and informal custodians of the chapel of St Peter-on-the-Wall, the core of Othona's shared Christian heritage with the Blackwater Estuary. A small team of permanent staff are joined by international volunteers on fixed-term placements, local community members and volunteers who are involved in regular activity and development. Over the decades since Motley's first gatherings, a distributed community of visitors has grown, who return when they can – including engineers, farmers, builders, scientists, musicians, healthcare workers, social workers, authors, conservators, clergy, archaeologists and teachers. As well as providing a space for quiet reflection, study and worship, Othona hosts a regular public programme of talks, work weekends and workshops. This activity responds to both the immediate environment, equality and social and ecological reconciliation, as well as shaping Othona's continued place and ongoing work in a shifting landscape.

Shielded from North Sea winds by a small wooded perimeter, the architecture of the community is low-lying and unassuming. Bordering the legal boundary of the proposed development site for Bradwell B, the off-grid open community produces much of its own electricity and takes care of its own waste through a three-tiered reedbed sewage system and in many ways provides a stark contrast to its industrial neighbour. Bradwell A has become as much part of Othona's past and future heritage as the saltmarshes, chapel, resident badgers and sea wall. The community includes both active and retired nuclear industry workers as well as those involved in both protests against Nirex, a UK body set up to examine safe, economic and environmental aspects of nuclear waste storage, which proposed a low-level waste repository at Bradwell in the 1980s and those involved in campaigns against the proposal for the new nuclear programme and waste storage in the present day. Othona publicly responded to the consultation for Bradwell B, opposing the impact of the initial construction and long-term operations on the environment, the local population and resources of Bradwell on Sea village, and their own continued existence in the Estuary. Whether a new nuclear power programme goes ahead in the near future or not, Othona is already entangled with the legacy of the nuclear industrial complex. In writing about the legacy of collective resistance and community in Essex, Othona could be mis-portrayed as a nail house, heels dug deep in an eroding place and time. However, there is a refusal to turn inwards to build a microcosm and away from critical issues and conditions, some of which we have highlighted in this chapter. Othona's endurance through previous attempts at organised and experimental communities perhaps lies in its active and continued openness in the face of economic and environmental pressures, its model of a distributed rather than closed community and an understanding that 'faith in action' requires imagination, hope and experimentation in equal measure. As a distributed 'community', Othona is both rooted and concretely present in the Blackwater Estuary, but importantly constitutes a geographically dispersed intergenerational group of people.<sup>63</sup> This 'model' alongside the community's public programme resonates with the interscalar analysis of artworks discussed earlier in this chapter. Like Old Tjikko of *Spruce Time*, Othona highlights the potential to reimagine and enact new forms of care, reconciliation, 'useful work' and 'living with' in the face of uncertain futures.

## Conclusion

Curatorial and artistic practices are generative ways to begin thinking with multiple scales and temporalities, particularly for place-specific

contexts. We argue that the art projects interwoven throughout this chapter operate as interscalar devices, as ways to situate a project spatially and temporally while gesturing towards that which extends far beyond the estuary's shores. This provides a sense, albeit speculatively, of how an art project around the Blackwater Estuary may develop, demonstrating the productive role art can play in pulling together and making connections from things that are perceived or understood to be separate.

Throughout this chapter we have attempted to articulate how art projects can embody interscalar sensibilities, enabling ways to hold complex and incommensurate realities within the same conceptual frame, from varying temporalities to disparate geographies. In Thomson & Craighead's *Temporary Index* or Goldin+Senneby's *Spruce Time* the viewer journeys beyond human timescales. In *We Have Always Known the Wind's Direction*, Halabi employs Caesium 137 to bear witness to purported illicit nuclear waste dumping and the uneven distribution of power and control around the West Bank. Similarly, Harun Farocki's *Inextinguishable Fire* gives the viewer a glimpse, albeit an inevitably inadequate glimpse, into the disturbing intensity of a napalm attack and broader geopolitical violence.

Other geopolitical tensions can be seen in Hirst's *How to Make a Bomb*, which confronts us with the nuclear colonial legacy of Essex, collapsing the geographical locations between Foulness Island and the Monte Bello Islands, Emu Field and Maralinga, where Britain tested its nuclear devices on Indigenous lands. Bringing our attention back to Essex, Hirst's *How to Make a Bomb* project demonstrates a way art can chart the county's nuclear history and the development of Britain's nuclear weapons programme in particular.

We have tried to give a sense of how contemporary art can ask questions about particular contexts, embracing the messiness and leakiness of any given landscape and how its interrelationships extend beyond the arbitrary boundaries one might impose. This opens up more questions than answers. How might a research-led project along these lines operate in the Blackwater Estuary? How might the graphite sitting in Bradwell A's aluminium-clad reactors bear witness to the changes that the Estuary faces? What interscalar stories could it tell us? We have embarked on our own project in relation to the estuary, which is an ongoing process involving regular visits, extensive research and conversations. As a part of this we are asking ourselves how non-human actors that inhabit the Estuary could contribute to these conversations. We suggest that the examples we have brought forward go some way to doing this. These are not necessarily our concluding remarks, then, but rather a provocation, a

point of departure searching for the possibilities that art opens up, demonstrating its capacity not merely to illustrate current affairs one dimensionally but also to become a generative and imaginative space that provides new insights into a particular context and its complex local and planetary entanglements, a space that embraces an ecology of knowledges and the different ways of understanding the world that this alludes to.

## Notes

- 1 Tsing 2015, 37.
- 2 The World Nuclear Waste Report, 2019. <https://worldnuclearwastereport.org/> [accessed 26 October 2020].
- 3 Schuppli 2020, 3.
- 4 Hecht 2018, 135.
- 5 On 'deep time' see Ialenti 2020.
- 6 On the critiques of the Anthropocene see Haraway 2015 and Moore 2016.
- 7 Hecht 2018, 110–15.
- 8 Schuppli 2020, 165.
- 9 The International War Crimes Tribunal for Vietnam was convened by philosopher and anti-war activist Bertrand Russell and aimed to inform public opinion and arouse opposition to the war. For a recent overview see Krever 2017.
- 10 Farocki 1969.
- 11 Schuppli 2020, 165.
- 12 Dr Graham Hall, University of Manchester, personal communication.
- 13 Carpenter 2020.
- 14 Two recent analyses of the Synod of Whitby and its impact are Stancliffe 2017 and Dailey 2015.
- 15 On Cedd's mission see Yorke, in this volume.
- 16 On the fish weirs see Andrews and Rippon, in this volume.
- 17 On the inning of marshes around Bradwell see Bruce and Thornton, in this volume.
- 18 <https://www.climatecentral.org/> [accessed 30 November 2020].
- 19 'Slow violence' is a term used by Rob Nixon to describe the deferred, gradual and attritional, disproportionate impact of industrial capitalist production on both the environment and poor, disempowered and often involuntarily displaced people, caused by events such as climate change, toxic drift and oil spills: Nixon 2013, 2. We include the slow violence of the processes that bookend the nuclear cycle which are often eclipsed by spectacular events. According to Hecht, 'nuclearity ... is a contested technopolitical category. It shifts in time and space. Its parameters depend on history and geography, science and technology, bodies and politics, radiation and race, states and capitalism.' Hecht 2012, 14.
- 20 For an overview of the archaeology of the Essex coast see Murphy and Brown 1996 and Murphy et al. 2012.
- 21 For the original landscape setting of St Peter's see Rippon, in this volume.
- 22 See Darley, in this volume, for the initial choice of Bradwell as a nuclear site and the manner in which the requirements of nuclear power disrupted the existing industrial map.
- 23 Masco 2006, 38.
- 24 Puig de la Bellacasa 2012, 198.
- 25 For further context see the government report on the Nuclear Decommissioning Authority's management of the Magnox contract: <https://committees.parliament.uk/publications/3703/documents/36067/default/>; and the Department of Energy & Climate Change's Geologic Disposal Facility White Paper: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/332890/GDF\\_White\\_Paper\\_FINAL.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/332890/GDF_White_Paper_FINAL.pdf) [accessed 30 January 2022].
- 26 The World Nuclear Waste Report 2019: <https://worldnuclearwastereport.org/> [accessed 25 November 2020].

- 27 On Onkalo see Foley 2021; on Yucca Mountain see Macfarlane and Ewing 2006.
- 28 Goldin+Senneby *Spruce Time* project proposal, 2019. [www.goldinsenneby.com/sprucetime.pdf](http://www.goldinsenneby.com/sprucetime.pdf) [accessed 20 November 2020].
- 29 On the challenges in conventional thinking on conservation to reconsider the capacity to care, restore, conserve in uncertain and potentially distant futures see DeSilvey 2017.
- 30 Carpenter 2016, 3.
- 31 Cooper et al. 2001, 31–40.
- 32 Bradwell was a favourite haunt of Essex nature writer J. A. Baker, whose most famous book, first published in 1967, recounted his obsessive tracking of peregrine falcons in and around the Blackwater Estuary. In his afterword to the 50th anniversary edition of the book, Robert Macfarlane comments on the nuclear threat that seems to pervade the text and mentions the peregrines nesting on the power station in 2014. Macfarlane 2017, 201, 207.
- 33 RSPB, <https://www.rspb.org.uk/our-work/casework/cases/Bradwell-B/> [accessed 23 September 2021]. Essex Wildlife Trust, <https://www.essexwt.org.uk/protecting-wildlife/policies-position-statements/bradwell-b> [accessed 23 June 2021].
- 34 Cooper et al. 2001; see also <https://www.essexwt.org.uk/news/restoring-saltmarshes-blackwater-estuary> [accessed 26 April 2022].
- 35 For a detailed history of the 1953 flood in Essex see Grieve 1959.
- 36 Essex and South Suffolk Shoreline Management Plan 2, 15 October 2010: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/289681/gean0310brva-e-e.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289681/gean0310brva-e-e.pdf) [accessed 26 April 2022].
- 37 The Planning Act 2008 (received Royal Assent 26 November 2008) legislation established the legal framework for applying for, examining and determining applications for Nationally Significant Infrastructure Projects.
- 38 Carpenter 2016, 3.
- 39 On Cedd's mission see Yorke, in this volume.
- 40 On the choice of Bradwell for a first-generation nuclear power station see Darley, in this volume.
- 41 There is rich scholarship across cultural geography, critical heritage and archaeology that articulates the complexity of modern material culture and the management of heritage sites. See, for example: Buchli and Lucas 2001; González-Ruibal 2006; Holtorf and Piccini 2011; McAtackney 2014; DeSilvey 2017.
- 42 UNESCO currently lists two sites associated with the nuclear industrial complex: Bikini Atoll and the Hiroshima Peace Memorial (Genbaku Dome).
- 43 For further literature focused on the Hiroshima Peace Memorial see Frost et al. 2019; for the nuclear military context of the Cold War see Hanson 2016; for Bikini Atoll's World Heritage listing see Brown 2013.
- 44 Olsen and Pétursdóttir 2016, 43.
- 45 Halabi 2019.
- 46 Schuppli 2020, 65.
- 47 Cohen 2015, 78.
- 48 Hirst and Harper 2020.
- 49 The Old Waterworks is an artist-led charity of which Warren Harper is the director. It provides studios, facilities and research and development opportunities for artists: <https://www.theoldwaterworks.com> [accessed 26 April 2022].
- 50 Lawless 2017, 80.
- 51 Cocroft and Newsome 2009.
- 52 On colonial botany see: Schiebinger and Swan 2005; Casid 2004; and Gray and Sheikh 2018.
- 53 Hirst and Harper 2020.
- 54 Nuclear colonialism refers to how the entire fuel cycle from uranium mining and refining to nuclear power and weapons development, production and testing, and the subsequent dangers of nuclear waste, disproportionately effects Indigenous peoples and their lands. See Churchill and La Duke 1986; Runyan 2018.
- 55 'House of Commons – Environment, Food and Rural Affairs – Third Report'. <https://publications.parliament.uk/pa/cm200102/cmselect/cmenvfru/407/40703.htm>. [accessed 26 January 2022].
- 56 Hornborg and Martinez-Alier 2016, 328.
- 57 CGN, [http://en.cgnpc.com.cn/engcn/c100080/2016-08/24/content\\_6bea6747185546458b887848d8c170d7.shtml](http://en.cgnpc.com.cn/engcn/c100080/2016-08/24/content_6bea6747185546458b887848d8c170d7.shtml) [accessed 20 November 2021].

- 58 Yusoff 2018, 53.  
 59 Yusoff 2018, 53.  
 60 On Othona and Motley see Worpole, in this volume.  
 61 On communitarian settlements in Essex see Worpole 2018.  
 62 On Frating Hall Farm see Worpole 2021.  
 63 Although the focus of this chapter is primarily located in Essex, Othona is also embedded in West Dorset.

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