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**Fossils of Time Future? Abstract Geologies, Atmospheric Politics and Boundary Markers at the Site(s) of Spiral Jetty**

Desert, sand and drought ridden landscapes are a recurrent motif in a number of the English speculative fiction writer J. G. Ballard's short stories and novels. The image of a parched earth where the boundaries between land and water are erased or under erasure, serves to act as a tonal flatline where characters and landscapes alike are thrown into an entropic process of decline or stasis. Like the waning power of the sun in planetary terms, many of Ballard's characters find themselves in a similar condition of malaise or succumbing to fugue states such as those depicted in the short story *The Voices of Time* (1960) where a curious form of sleep sickness is affecting growing numbers of the population. In the story the central character Powers, a neurosurgeon, has contracted the narcoma syndrome that he has been studying and treating, and in the remaining days of his ever-shortening waking life he becomes obsessed with recreating a strange mandala left behind by his colleague Whitby on the floor of an abandoned swimming pool. The mandala appears to represent a giant solar disc with four radiating arms. Powers becomes fascinated by work produced on the 'silent gene' by Whitby prior to his death and spends time at the biologist's laboratory, which is filled with plants and animals that Whitby has experimented on with a 'whole-body irradiation technique based on his observation of radiobiological damage at Eniwetok' (Ballard, 2011, p.240). This reference to the Pacific island of Eniwetok, site of numerous post-war nuclear tests, is no coincidence and recurs again in the short story *The Terminal Beach* (1964) in which an ex-air force pilot called Traven wanders amongst the contaminated and abandoned concrete bunkers and blockhouses of the island in search of his lost wife and child. In both stories references to the sun and to nuclear radiation abound as though the two are intricately connected. There are implicit suggestions that the radiation emitted by the nuclear tests has led to genetic damage and mutation, in the light of this the landscapes and the characters depicted are revealed as provisional, ghostly apparitions of time past and time future. Ballard informs us that the island inverts 'the geologist's maxim, "the key to the past lies in the present." Here, the key to the

present lay in the future. This island was a fossil of time future' (Ballard, 2006, p.32-33).

In *The Voices of Time* Powers explains that Whitby's research into the silent genes 'represents a last desperate effort of the biological kingdom to keep its head above the rising waters. Its total life period is determined by the amount of radiation emitted by the sun, and once this reaches a certain point the sure-death line has been passed and extinction is inevitable' (Ballard, 2011, p.245). Whitby's theories suggest that a reverse evolution is underway, one that forms a spiralling motion that is echoed throughout the narrative in references to the mandala; the narcoma syndrome; Powers' unconscious doodling and in the architectural form of a summer house that loops in a spiralling concrete ribbon. As Powers' condition deteriorates he sets about building a version of the spiralling mandala at the edge of a salt lake in the desert, he then irradiates himself at Whitby's lab and drives back to the lake to enter the mandala, now completely attuned to the landscape around him, its geological depths and microcosmic subtleties, becoming one with the cosmic forces of the universe and the voices of time.

Ballard's themes of planetary change, geological time, physical and temporal dislocation and the relationship between the sun, nuclear radiation and the desert are all central to this paper. There are striking parallels to Ballard's work in Robert Smithson's *Spiral Jetty* - a vast spiralling monumental sculptural earthwork built on the edge of the Great Salt Lake in Utah (1970), a film (1970) and an essay (1972). Smithson was a keen reader of science fiction and books by Ballard have been catalogued in his library as well as appearing as quotes in his writings. Across the different artistic sites of *Spiral Jetty* Smithson pursued a form of 'abstract geology' (Smithson, 1996a, p.100) where the material histories and entropic forces of the planet are seen to affect consciousness and exert pressures on the human body. In this paper Smithson's work is resituated to the material landscapes of its production and presentation in the deserts of the American (US) Southwest, linking it to the early atomic weapons tests that took place in the region from the late 1940s to the early 1960s. The discussion will move between artwork, material site, immaterial affect and planetary politics in

order to speculate on the notion of aesthetic temporalities that move beyond the human. This process will utilize methods of textual assemblage that mimic Smithson's modes of practice from his early pop art collages to his later mixed media assemblages that combined landscape fragments with references drawn from science fiction, history, geology and geography. The use of assemblage as a textual method can be seen to contribute to non-linear, aesthetic and material models of thought that challenge traditional discursive and representational frameworks. Frameworks that, I argue, are inadequate to the task of thinking in the Anthropocene.

### **Sun Spots and the Burning World**

Images of the *Spiral Jetty* earthwork highlight the pinkish red colour of the lake where the work is sited. Smithson recounts how it was his discovery of the micro bacteria that populate salt lakes in Bolivia giving them their distinctive red colour that led him to The Great Salt Lake in Utah the Northern section of which, he was reliably informed by a member of the Utah Parks Department, "was the colour of tomato soup" (Smithson, 1996e, p.145). *The Spiral Jetty* essay reinforces the importance of colour for Smithson from the outset. The artist begins with a quote from the writer G. K. Chesterton: "Red is the most joyful and dreadful thing in the physical universe; it is the fiercest note, it is the highest light, it is the place where the walls of this world of ours wear the thinnest and something beyond burns through" (Smithson, 1996e, p.143). The colour red and the notion of a burning force can be seen to frame the work. The essay is rich in further references to the materiality of colour as Smithson recounts his journey to The Great Salt Lake and the immensity of the landscape surrounding it. Colours suffuse his descriptions of the site from the 'silver band' of the lake in the distance and the 'amber light' covering the hillsides, to the 'black basalt,' 'pinkish water' and the 'violet' of the lake up close against the 'crushing light' of the sun (Smithson, 1996e, p.145-146). Along with its particular bacteria The Great Salt Lake was also chosen for its high saline content which would contribute to salt crystals growing on the sculpture over time. The links between light and colour are echoed in the crystal which, in turn, is further echoed in the spiral form of the Jetty. The Jetty acts as a visual metaphor of time in continuous movement forwards *and* backwards. Smithson

relates these crystalline structures to the human body initially then extends these relations outwards to encompass more-than-human, planetary timeframes (1996e, p.148):

On the slopes of Rozel Point I closed my eyes, and the sun burned crimson through the lids. I opened them and the Great Salt Lake was bleeding scarlet streaks, my sight was saturated by the colour of red algae circulating in the heart of the lake, pumping into ruby currents, no they were veins and arteries sucking up the obscure sediment. My eyes became combustion chambers churning orbs of blood blazing by the light of the sun. All was enveloped in a flaming chromosphere.

The opening scene of *Spiral Jetty* the film presents an image of the sun starkly juxtaposed against a black background in a telescopic close up. Explosive solar flares bounce off the sun's surface creating a picture of vibrant matter, a planetary perspective of instability and a glimpse of the future imagined in thermodynamic terms as the eventual heat death of the universe as the sun's energy dissipates outwards. The sun plays a central role in the film from the opening sequence where it dominates the screen, to the repetitive shots of sunlight shimmering and reflecting off the water of the lake, to Smithson's closing narrative on the effects of sunstroke (see Fig.1). The essay continues (Smithson, 1996e, p. 148):

Swirling within the incandescence of solar energy were sprays of blood. My movie would end in sunstroke. Perception was heaving, the stomach turning. I was on a geologic fault line that groaned within me. Between heat lightning and heat exhaustion the spiral curled into vaporization. I had the red heaves, while the sun vomited its corpuscular radiations. Rays of glare hit my eyes with the frequency of a Geiger counter.

This passage merges bodily references to blood, dizziness and vomit with 17<sup>th</sup> century theories of light and atomism alongside allusions to nuclear contamination, energy and measurement. The sun functions across the sites of *Spiral Jetty* as both matter and metaphor. Hal Foster suggests that Smithson 'evokes a burning-through of the image screen through an opening to light' (2004, p.299), identifying that the emulsion of the film stock with its light sensitivity can be seen to embody a reference to the entropic forces of the universe in its very material fabric. Gary Shapiro also draws attention to Smithson's use of the sun highlighting the artist's narration of the clinical effects of sunstroke toward the end of the film, which include references to the loss of memory and an inability to

concentrate: 'at that point, after half an hour of blaze and glare, we might well wonder whether we have been subjected to a similar form of disorientation, because by then, deprived of our accustomed sense of time and narrative (memory), we have lost that ability to clearly focus from a centre that is necessary for concentration' (1995, p.13). The presence of the sun as an optical device in tandem with the formal composition of the sculptural-earthwork and the montage structure of the film, all serve to reinforce the continual sensation of dizzying movement and the lack of any fixed viewing position.



Fig.1 Robert Smithson. *Spiral Jetty*, film still, 1970.  
Courtesy Holt-Smithson Foundation and Electronic Arts Intermix (EAI), New York

Once these nuclear-solar references are re-situated to *Spiral Jetty's* original contexts of production and presentation in the deserts of the Southwestern United States (US) it seems impossible to experience these images of glaring heat, light and disorientation and to witness the destructive material forces at work across Smithson's film without recalling the spectacular images of the desert nuclear tests that took place in the area in the post war period. Following the initial atomic test carried out at Trinity, Alamogordo in New Mexico on July 16<sup>th</sup> 1945 the

physicist Robert Oppenheimer, when later asked how he felt, famously recalled two passages from the eleventh chapter of the Bhagavad Gita where the Hindu god Vishnu says: 'If the radiance of a thousand suns were to burst at once into the sky, that would be like the splendour of the Mighty One ... Now I am become Death, the destroyer of worlds' (Williams, 2011, p.202-203). William Laurence, the official historian of the Manhattan Project echoed Oppenheimer's response and his appeal to the magnitude of forces beyond the human, writing in 1946 (Ponte, 2014, p.105):

And just at that instant there arose from the bowels of the earth a light not of this world, the light of many suns in one. It was a sunrise such as the world had never seen, a great super sun... Up it went, a great ball of fire about a mile in diameter, changing colours as it kept shooting upward, from deep purple to orange, expanding, growing bigger, rising as it expanded, an elemental force freed from its bonds after being chained for billions of years. For a fleeting instant the colour was unearthly green, such as one sees only in the corona of the sun during a total eclipse. It was as though the earth had opened and the skies had split.

This image of an elemental primordial force and a 'thousand suns' emerges in Smithson's work as the sun violently sends out its explosive solar flares; interferes with vision; bleaches out or heightens colour; parches the earth; sends the body into delirium; reflects and refracts off water and camera lens and eats into the film stock itself as raw material. The sun functions as a vibrant material force. It acts as a visual metaphor of life as well as an entropic symbol of its demise. The atomic explosion or 'super sun' offers an accelerated depiction of this process, a form of reverse evolution in J. G. Ballard's terms where life forces spiral backwards through the destructive force of the blast and radioactive fallout. Human time is arrested in this process and planetary time emerges to counter any proposal for a linear version of history.

### **Pillars of Salt: Crystalline Time, Capital Time.**

The harnessing of the salt crystal in the *Spiral Jetty* can be seen as a further material index of non-linear temporality that calls into focus a sense of planetary time alongside the specific geopolitics of place that emerge at the site. As noted, Smithson carefully selected Rozel Point on the Great Salt Lake in Utah for the red algae colouring the water and the high saline content of the lake that would

produce the hoped for effect of salt crystals later forming on the spiral base structure. Jennifer L. Roberts (2004b, p.97) describes how this use of the salt crystal 'articulates a perpetual belatedness' in relation to the work itself and, as an indicator of an extended temporality, situates *Spiral Jetty* geographically in relation to its chosen site. For Roberts, the specificities of the location are revealed not through its relation to the nuclear proving grounds but through its proximity to the Golden Spike National Historic Site that lies 17 miles away. The Golden Spike was a ceremonial final spike produced to mark the completion of the transcontinental railroad in 1869 linking the Central Pacific and Union Pacific railroads at Promontory Summit in Utah. Roberts charts the significance of this event within a framework of technological and economic progress and the introduction of mechanized and standardized measurements of time via railroad timetabling.

The introduction of standardized time in the 19th century is a well-documented aspect of the development of capitalism and its impact on time and space. David Harvey for example, has written extensively on notions of 'time-space compression' since he first articulated the concept in his 1989 book *The Condition of Postmodernity*. Harvey emphasises the symbiotic relationship between geography and technological development charting capital's emphasis on techno- and spatio-temporal 'fixes' throughout its history. These two 'fetish beliefs' work together to expand capital into new markets that reduce distances and speed up circulation: 'The list is endless. Where would we be without canals, railroads, steamships, automobiles, highways, air transport, telegraphs, radios, telephones, electronic communications and the like?' (Harvey, 2010, p.158). References to time's annihilation were common in the 19<sup>th</sup> Century as the development of an expanded railway network reduced temporal distances and journey times. The expansion of the railway system also introduced standardized time over local *times* in order to increase efficiency through reliable timetabling and to reduce accidents. Developments in the railway network were also closely linked with advances in communications technologies and the introduction of simultaneous forms of communication via the telegraph and the telephone for example which ushered in a period of 'convergence' in time-space (Stein, 2001, p.109).

In contrast to the notion of standardized time as memorialised in the Golden Spike Monument, Roberts cites Smithson's model of 'crystalline' time that disregards linear or progressive models by imagining time as an opaque encrustation around a fault or fracture. Here time has no connection to an origin or centre; it begins with a 'dislocation' and accumulates from without. Time does not pass or fly, it accretes, building up as material sediment that remains indefinitely, constantly subject to change and dissolution (Roberts, 2004b, p.98). In this reading *Spiral Jetty* therefore offers a parallel narrative of organic time, an alternative model to the dominant modern framework in the standardized time of capital. Time is marked as slow moving and incremental, subject to external forces, to seasonal and climatic variations. At the Great Salt Lake where the water moves in response to the Earth's gravitational pull, water continually passes over the Jetty and laps at its edges. For many years the *Spiral Jetty* was completely submerged under water after high rainfall and flooding only to resurface in 2002 after several years of continuous drought in the region. Upon resurfacing the structure had been completely covered in white salt crystals offering a physical and material reminder of the passage of time marked in terms of geological rather than human time.

Instead of fixing a moment of historical time as the Golden Spike Monument seeks to do, the *Spiral Jetty* proposes 'a different memory and a different form of historical monument – one that does not compulsively attempt to return to a single privileged moment in a perspectively organized historical past but rather one that acknowledges the materiality, specificity, and opacity of history even as it redeems and preserves it' (Roberts, 2004b, p.103). The monument provided a form and a framework for Smithson to explore his absorption with human and geological temporalities. In his 1966 essay 'Entropy and The New Monuments' written for *Artforum* magazine for example, Smithson wrote about the artistic work of his contemporaries, declaring that the Minimalist artists' use of modern, artificial materials including plastic, chrome and electric light: 'instead of causing us to remember the past like the old monuments... seem to cause us to forget the future' (Smithson, 1966, p.11). Smithson undermines ideas of technological



progress through his appeal to material and geological timescales and through his emphasis on entropy as both concept and process.

It is significant to note in the context of this discussion debates unfolding that seek to fix a start date for the Anthropocene. Recent disputes over the exact dating revolve around early forms of land use and agricultural practices that intervened in the natural landscape on a significant scale; the invention of the steam engine and the dawn of the Industrial Revolution; and the period of the Great Acceleration beginning in the second half of the twentieth century. Papers published by members of the Anthropocene Working Group in 2015 discuss the difficulties of adopting any of these historical timeframes as a single 'geochronological and chronostratigraphical' reference point able to mark a substantial alteration in the Earth system indicating that 'the physical and chemical nature of the deposits, and their fossil contents, are recognizably different above and below the boundary' (Zalasiewicz, et al. 2015, p.197). Geologists traditionally seek to establish a single reference point at a specific location that is able to mark the lower boundary in a succession of rock layers, (interestingly also referred to informally as a 'golden spike'). The Anthropocene Working Group argue that there are too many significant variables attached to each of the above historical timeframes with the exception of the latter mid twentieth century boundary marker that ushered in the period of the Great Acceleration. Whilst there are a number of events that are associated with this period - including, for example, growth in worldwide population figures and increased urbanization, the increased use of chemical fertilizers, developments in transportation and increased mobility - the authors demonstrate that a discrete boundary layer change can be established in the presence of radionuclides released from the earthbound and atmospheric nuclear tests that began on 16<sup>th</sup> July 1945 with the explosion of the first atomic bomb at Trinity, Alamogordo, New Mexico. Although the effects of this initial test were not registered immediately in stratigraphic terms, the cumulative effects of the following period of intense nuclear testing have left a significant physical and chemical trace offering a stratigraphic boundary marker. The 'radioisotopes appear in ice at both poles and on all continents' (Zalasiewicz, et al. 2015, p.200).

The Trinity test did create an immediate material marker in the form of a new mineral known as Trinitite, forged through the force of the blast and the intensity of the heat that fused together the desert sand and other material at the site into a molten liquid that later cooled in the form of glass-like rocks. These newly created material by-products from nuclear explosions undertaken in the desert test sites of the southwestern US seem to perfectly encapsulate Smithson's notion of the 'reduction of time down to fractions of seconds rather than... the long spaces of centuries' (1996b, p.11) and have retrospectively become trace fossils marking the dawn of the Anthropocene era. Their crystalline forms capture a moment when the most advanced human technology altered Earth's geology through a process of acceleration and condensation, a form of planetary space-time compression that was simultaneously juxtaposed with the longer duration of atmospheric dispersal, fallout and sedimentation.

### **Abstract Geology: Sedimentation and the Transcategorical**

Within the film of *Spiral Jetty* there are repeated references to prehistory and dinosaurs juxtaposed with images of modern machinery including a truck, a digger, a helicopter and a film camera. At the start of the film we witness a view of the road looking ahead from inside the truck accompanied by the distinctive sound of a clock ticking. The film then cuts to a view of the road looking backwards followed by a map of the ancient area of Lake Bonneville whilst Smithson recounts an historic myth of the site's connection to the Pacific Ocean via an underground whirlpool, a myth he informs us that was not overturned until the 1870s. The perpetuation of this myth, which came about through the early Euroamerican settlers' confusion over the presence of a salt water lake so far from the ocean, read in the historical context of the intercontinental railroad's arrival in 1869 testifies to the multiple, coexistent and often incompatible narratives of 'progress' that might inhabit a site at any given moment.

The film continues to depict views of the road looking forwards and back when we suddenly find ourselves in an interior space that is entirely coloured red. As our eyes adjust to the change of space, light and colour we begin to make out the presence of fossils and dinosaur skeletons in glass cases. We are inside a museum

which we later find out (from the essay) is the Hall of Late Dinosaurs in the American Museum of Natural History. The film contextualises and extends *Spiral Jetty*, the material-sculptural work, within a broader temporal and geographical narrative that stretches time outwards from the present to incorporate the prehistoric past and a science fiction future. Images of dinosaurs juxtaposed with machines, ancient maps and myths of the site with aerial views shot from the helicopter, and images of the salt crystals-to-come are presented within a dizzying montage of image and narrative. The form of the film mimics its content as it spirals back and forth, loops and circles around its subject. Smithson deliberately plays with notions of spatial and temporal scale here and refers to an 'interior immensity' that spreads throughout the hall 'transforming the lightbulbs into dying suns' (1996e, p. 152).

In the film the machines stumble and falter in the terrain becoming lumbering prehistoric beasts. Images of dinosaurs, in the museum cases and as drawn images, are interspersed with film footage from the site. The artist's fascination with prehistory and an extensive notion of time is bound up with his focus on geology, materiality and 'rock time'. Rocks feature significantly in the artist's work, materially in his non-site pieces where they are frequently brought into the gallery from external landscape spaces, and psychologically in his thoughts on geological time and prehistory. Geological notions of strata and sedimentation in the Earth are also linked to psychological and aesthetic processes and practices and to descriptions of language, which seems to be inadequate as a tool for ordering thought and as a container for meaning. Body, mind and geology follow a similar entropic pattern as they merge into one another. As Smithson writes (1996a, p.100):

One's mind and the earth are in a constant state of erosion, mental rivers wear away abstract banks, brain waves undermine cliffs of thought, ideas decompose into stones of unknowing, and conceptual crystallizations break apart into deposits of gritty reason. Vast moving faculties occur in this geological miasma and they move in the most physical way. This movement seems motionless, yet it crushes the landscape of logic under glacial reveries. This slow flowage makes one conscious of the turbidity of thinking. Slump, debris slides, avalanches all take place within the cracking limits of the brain. The entire body is

pulled into the cerebral sediment, where particles and fragments make themselves known as solid consciousness.

This collapsing of mind and matter into one another and the intertwining of earth's materials and processes with the emergence of thought is a back and forth movement. Smithson acknowledges the pretensions of rational thought and logic or what he calls the 'mechanistic world view' to order, linear progress or the creation of a 'perfect system'(1996c, p.201). He instead sees in the processes involved in language and thinking a dynamic pattern of movement, accretion, sedimentation, loosening, 'breaking apart and bleeding at the edges', Smithson goes on to state 'If I am interested in concepts, the concepts are so much sludge collapsing down the side of my brain' (1996a, p.202). It is possible to identify a prescient attempt here by Smithson to shift thought towards an acknowledgement of the material, geological and planetary forces at work within human consciousness expressed through his unique form of 'abstract geology' (1996a, p.100). The Anthropocene proposition has exposed human and non-human entanglements as a necessary condition of any future thought, it arguably demands a shift towards other forms of agency beyond the human and acknowledging the challenge to thought that opens up as a consequence of this extended planetary framework. The presence of geological temporalities and the material forces of entities including dust, mud, sand, gravel, and clay within the mind, and therefore within language, disrupt the mechanistic world view and models of universal or standardized time exposing their cultural-historical and therefore their human specificity.

Smithson invites us to experience the work of art not as a discrete object contained in a museum, gallery or site, but as a material assemblage within a broader temporal, historical and extended material framework. His dialectic of the site/non-site works to capture this sense of extension and the relational quality of the objects/projects. The site functions as a specific geographic location in the landscape, although Smithson theorises this 'place' in fairly open terms using references such as 'A Series of Points', 'Outer Coordinates' and 'Scattered Information' in a list presented in the *Spiral Jetty* essay. In contrast, the non-site is where references – material, topographic and historical - are transposed into a

contained setting such as a gallery or museum space. In a number of works Smithson constructed literal containers in the gallery space that held earth, rocks and other material from the physical site alongside further references to the geographic location in the form of maps, photographs and drawings.

Smithson's dialectic of place as articulated via the site and non-site relation extends his engagement with mind and matter, presence and absence, inside and outside, abstraction and the materiality of the here and now. These connect with notions of the fixed/bounded and the dedifferentiated through what Roberts (2004, p.6) refers to as 'his unabashed contamination of idealistic aesthetics with materiality, contingency, and physical labour; his dislocation of the traditional sites of artistic production; his complication of the authorial function; and his violation of disciplinary boundaries'. *Spiral Jetty* exemplifies this violation of boundaries in its multiple formats of presentation. Within the film, in parallel to the lumbering awkwardness of the heavy machinery, Smithson himself struggles to navigate the terrain as he runs, trips and lurches from side to side around the Jetty advancing to its centre under the watchful gaze of the airborne camera's eye that zooms in and out as it circles overhead. The sun spots that bounce off the camera lens interfere with our vision as viewers and disrupt the clarity of the aerial perspective – the traditional Archimedean viewpoint that is meant to bestow an objective position - just as the images of maps from different periods of history and prehistory overlay geographic space like palimpsests. The presence of Smithson's physical body, vulnerable as it stumbles over rocks beneath the helicopter circling overhead, reemphasizes the partiality of the situated position. In these shots of the body from above (as sculpture, as site and as human flesh), the gaze is far from conquering. It falters, blurs, is blinded and loses perspective.

Following Roberts, we might read the work's multiple material formats across sculptural practice, text, and film as a further element in this disruptive, non-linear and overlaid sense of time-space. Peter Osborne, writing about postconceptual practice in contemporary art, cites Smithson's expanded practice across multiple formats as 'fundamentally transcategorical' (2013 p.108). Osborne finds in Smithson's development of the site/non-site dialectic an enriched notion of

practice that resists easy categorization and begins to challenge the 'ontology of mediums (painting, sculpture, architecture, photography, film, video)' marking its critical historical significance for contemporary practice. He goes on to note: 'what is interesting critically about Smithson's work is the extreme tension between, on the one hand, the complex rationality or intellectual logic of its construction – that is, the deliberate, staged *crossing* of categories (its *transcategorical* character) and, on the other, its final staging of determinate breakdowns or *meltdowns* of categorization in various different ways' (2013 P.108). Whilst Osborne does follow a limited historical analysis of Smithson's work in order to bring Smithson into a conceptual art framework in support of his theory of the contemporary, the concept of the transcategorical is a useful one for this discussion. <sup>i</sup> The transcategorical, in this context, works to expose existing epistemological and representational frameworks as fundamentally inadequate to any confrontation with the altered state of the human and the planetary within the Anthropocene. Categories and materialities have become scrambled whether we like it or not and works like Smithson's with their entanglements of mind and matter might now be read as an archaeology of the future in their ability to reflect this.

### **Nuclear Time, Slow Violence, and Atmospheric Politics.**

The earthbound, underwater and atmospheric nuclear tests conducted throughout the late 1940s until the signing of the first Limited Test Ban Treaty in 1963, ushered in an era of advanced research in the earth sciences that led to a new vision of the globe as an 'integrated political, technological and environmental space' (Masco, 2010, p.9). In what appears to be a paradoxical position from a contemporary perspective, the post-war period of nuclear militarism and the threat of 'mutually assured destruction' that would ostensibly initiate the most extreme ecological catastrophe imaginable, fundamentally contributed to a developing awareness of the biosphere as an interconnected whole. Geophysical mapping of the oceans, the earth and the atmosphere began to track the effects of radiation and the dispersal of fallout leading to the discovery of radiocarbon dating, awareness of the importance of carbon dioxide uptake by the Oceans and the discovery of a high level of fossil fuels circulating in the Earth's atmosphere.<sup>ii</sup>

The extensive period of nuclear testing that took place between 1945 and 1992 is however, as we have seen from the use of boundary markers in dating the Anthropocene, part of a longer duration that stretches forwards in geological, biological and ecological terms. The production of nuclear weapons (and nuclear power) requires the processing and enrichment of uranium, which produces highly toxic transuranic waste products including strontium, cesium, and plutonium. The half life of plutonium 239 is 24,110 years, this figure refers to the amount of time it takes for half a given amount of radioactive material to decay into other less harmful elements. It takes several hundred thousand years for plutonium to fully degrade to a non-harmful state. These transuranic elements are therefore unique in material terms, presenting, according to Valerie Kuletz (2001, p.242) 'complex and problematic containment strategies.' Functioning as material resource and waste matter simultaneously, transuranic elements become a 'commodity/problem with the ability to alter the biological genetic structure of all living things, to mutate cells and cellular growth, to produce energy in ways that it can power or obliterate whole cities. As such the transuranic elements' power is monumental' (2001, p.242-243) and this monumentality presents us with another perspective of scale in the desert spaces of the Southwest where the problems of nuclear fallout have affected land, water, air, animals, and communities of people for the past seventy years.

Kuletz documents the effects of nuclear militarism in the region, detailing the experiences and interests of a range of different and often incompatible actors from the might of the military-industrial-scientific-state complex with their treatment of the region as a 'national sacrifice zone,' to the relationships of the Native American communities who inhabit the area with the land (1998, p.7). Competing narratives emerge of the desert as a peripheral or void space open to experimentation, exploitation and sacrifice, and the desert as a sacred geography with a fundamental relationship to cultural survival. Kuletz undertook research at a time when Yucca Mountain in Nevada had been selected as a national waste repository for spent nuclear materials. This project is still pending but would, if realised, present an unwitting monument to a new Golden Spike in the region, a

nuclear monument that marks the dawn of the Anthropocene. The force of Kuletz's argument against the continuing 'internal colonialism' at work in the use and the representation of this desert site serves to highlight how matter – particularly seemingly invisible and 'immaterial' matter - comes to matter. It also highlights the significance of Smithson's site/non-site dialectic as a method of transcategorical practice that might work to create assemblages across geographic, political, material and cultural boundaries. Kuletz (1998, p.6-7) highlights how:

Naming and mapping the nuclear landscape opens a space for other critical narratives to emerge: narratives about science (and what constitutes objectivity), power (and the representations used to legitimate it), racism, and cultural marginalization... mapping the nuclear landscape employs the political practice of *seeing* purposefully unmarked and secret landscapes; it makes visible those who have been obscured and silenced within those landscapes... extensive zones of sacrifice are allowed to emerge as the price for, and inevitable result of, a particular set of power requirements.

In *Terror From the Air* (2009) the philosopher Peter Sloterdijk examines the use of gas warfare in the trenches of the First World War as the initiation of a form of 'atmospheric terrorism' that facilitated the emergence of the environment as a key concept of the 20<sup>th</sup> century. He locates the origin of this in a specific temporal moment that took place on April 22<sup>nd</sup> 1915 when a German regiment launched chlorine gas over the Ypres front towards unsuspecting French troops. The significance of this act in the midst of an already bloody and horrific conflict cannot be underestimated as the nature of the attack marked a profound shift in the terms of engagement. Once the gas was released it was its very invisibility coupled with its spatial extent that caused maximum damage to the opposing troops. In its early incarnation the gas could not be seen or smelt, the soldiers on the French side only became aware of the attack at the moment when the very thing they took for granted in the muddy, rat infested, bullet and shell-ridden trenches they were occupying, became explicit through its sudden removal, and that 'thing' was the air that enabled them to breathe. Through the introduction of this air bound toxicity the war shifted focus from an attack on the individual body of the enemy soldier to his surrounding environment, to the atmospheric conditions needed for his survival. For Sloterdijk this ontological shift from the human-body at the centre of things *to* its environment marks a profound moment;



in the process of this atmospheric 'explication' Sloterdijk foregrounds the conditions under which that body is able to be, and to breathe, in the first place and goes so far as to claim that 'the discovery of the "environment" took place in the trenches of World War I' (2009, p.18).

It is through this making explicit of the air, the revealing of the background conditions necessary for survival, and the deliberate targeting of those conditions through their violent erasure via state-sponsored terrorism that, according to Sloterdijk, the environment emerges into 'formal representation' (2009, p.23). From this point on it was no longer possible to take for granted the atmospheric conditions of environmental inhabitation, the simplicity of breathing uncontaminated air. Whilst it is possible to trace a history of air pollution prior to this – not least through the toxic emissions of the industrial revolution – this particular historical moment marked the first point at which the contamination of the atmosphere became selective, strategic and state-sponsored. The First World War initiated an industry for the design and manufacture of lethal gases, breathing instruments and portable oxygen cylinders and an attendant scientific and technological milieu in which the attempt to define, delimit and control atmospheric conditions developed. This relationship between war, terror, the pollution of the atmosphere and environmental monitoring was echoed and extended in the Cold War period when the technological expansion beyond the bounds of the planet into space coincided with the nuclear arms race and the need to understand the effects of nuclear testing on the environment in order to prepare for the very real possibility of a post-nuclear landscape on Earth. The proving grounds of the Southwestern US deserts played a central role in the expansion of the post war military-industrial-scientific complex.

Sloterdijk's reflections on atmospheres in *Terror from the Air* and his major work *The Spheres Trilogy* written between 1998 and 2004, offer a series of interrelated spatial concepts that refine this notion of the explication of the environment through reference to 'atmospheric envelopes' and 'air-conditioned spaces'. His account is a spatialized ontology of being-in-the-world. He asks not the question 'Who or what are we?' but rather 'Where are we?' For Sloterdijk, being-

*in* a world or sphere is also, fundamentally, social co-existence or being-*with*, and this co-habiting 'condemns' us to live with others (human and non-human) in interdependent atmospheric surrounds where any notion of an exterior or independent outside has now disappeared. This disappearance of the outside is a consequence of the making explicit of our environmental conditions, of the fragile life support systems that enable us to be and to breathe. This is why air plays such a central feature in his writing as it exemplifies that most fundamental yet invisible atmospheric support that is *the* precondition of our existence. Being-in-the-world is therefore always already spatial *and* social due to our immersion in shared atmospheres and communal environmental interdependency. Inhabitation is necessarily *cohabitation* (2011, p.83). Sloterdijk's account establishes a politicised and relational understanding of inhabited spaces that has implications for post-anthropocentric thought. His thinking offers a hybrid ontology requiring 'a new politics of trans-human symbiosis,' (2005, p.174) in which the human is no longer the privileged term. The radical shift in temporal scales that is brought about by the Anthropocene can be seen to gesture towards this politics as the human and the geological become more explicitly entangled. This entangling is foregrounded across the multiple sites of Smithson's *Spiral Jetty* with its trans-human spatial and temporal assemblages that merge humans with machines, dinosaurs, rocks, salt crystals, and the sun.

Kuletz's study of the nuclear landscapes of the Southwestern deserts maps a number of Native American social-historical and spiritual-cultural relationships to the land, which she characterises as possessing, in part, a more relational and 'intersubjective' connection to nature in contrast to the dominant Euroamerican military-scientific culture in which subject and object and nature and culture continue to be split off from one another. In tracing these different ontological and cosmological frameworks in relation to the landscapes under discussion, Kuletz also draws on a broader material framework of reference citing the correlation between intersubjective models of life and practices of long land tenure for example. The Western Shoshone and Southern Paiute nations who have inhabited the Southwestern interdesert region for millennia describe the land as 'sacred'

with particular geological and geographic sites, boundaries and landmarks signifying places of origin and emergence (places of significance in relation to creation myths), or as holy sites of ancestral significance such as burial areas. The importance of the concept of *puha* as a significant aspect of indigenous environmental ethics in the region has also been documented.<sup>iii</sup> This impersonal force or kinetic power is seen to have the potential to move through or reside in any natural or living thing. The concept of *puha* therefore plays a significant part in an extended, non-anthropocentric and trans-human cosmology that manifests as a form of 'animist intersubjectivity' connoting 'an intimate relationship between humans and other sensing beings in particular culturally significant places where communication across humans, animals and landscape occur' (Endres, 2013, p.186). In the case of Yucca Mountain the land is signified as a living and breathing ecosystem that contains life, encompassing humans, animals, plants, water, earth, spirits and other beings of spiritual and cultural significance. Such reference points remind us of the importance of decolonising thought in the Anthropocene. The search for 'new' modes of thinking often reveals pre-existing cosmologies of thought that not only predate Western perspectives but have continued to run in parallel to them whilst remaining invisible to existing hierarchies of interpretation.

Euroamerican military and scientific discourse has, in contrast to the indigenous response to the landscape, structured the Southwestern desert region repeatedly as lacking use-value despite simultaneously exploiting the rich resources found there for their economic and material gain. These resources include uranium, oil, natural gas, coal, gold, silver, copper and bauxite amongst other valuable minerals. Native American lands are some of the richest in the United States in terms of mineral resources and fossil-fuel deposits yet, as Kuletz and others point out, the continued description of these resource-abundant lands as wastelands strategically enables their simultaneous designation as dumping grounds and weapons testing ranges (1998, p.13). From the push Westward and the development of an expansionist logic of the frontier in the nineteenth century the Southwestern deserts have been invasively mined, bombed, subjected to testing above and below ground. The limited water sources present have been redirected,

polluted or used up altogether, and the fauna, flora and human inhabitants subjected to nuclear contamination with environmental and genetic repercussions that vastly transcend a human life span. If the military-industrial test sites and proving grounds of the Southwestern deserts represent the technological excesses of war and the belief in technology as progress then the proposal for the Yucca Mountain Nuclear Waste Repository represents a dark ecological counter narrative of slow violence, displaced and delayed fallout in both literal and metaphorical terms. Within the spaces of the nuclear desert therefore we are confronted with a violence of speed *and* slowness, a temporal dislocation that exceeds the time of the human propelling us forwards into Ballard's notion of the fossils of time future. In environmental historian Rob Nixon's terms (2011 p.2):

By slow violence I mean a violence that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space, an attritional violence that is typically not viewed as violence at all. Violence is customarily conceived as an event or action that is immediate in time, explosive and spectacular in space, and as erupting into sensational visibility. We need, I believe, to engage a different kind of violence, a violence that is neither spectacular nor instantaneous, but rather incremental and accretive, its calamitous repercussions playing out across a range of temporal scales. In so doing, we also need to engage the representational, narrative and strategic challenges posed by the relative invisibility of slow violence.

In the post war period it has become evident that the rate of exploitation of non-renewable resources is infinitely faster than the processes of geological sedimentation taking place over millennia in the earth. Industrial and capital time are incommensurable with geological time. Despite a host of warnings throughout the twentieth century to this effect, it seems that collectively, as a species, we are still unable to fully acknowledge and act on the threat to our continued inhabitation on this planet and to develop the necessary skills needed to think speed (framed as technological progress) and slowness (framed as geological and planetary materialism) together *at the same time*. The Anthropocene concept's migration from the geological sciences into the humanities goes some way to collapsing these different temporal and planetary scales and in bridging the gap between 'reading the rocks' in relation to the human. However, there is clearly more work to be done in order to give new imaginative and (non)representational

forms to these narratives in a broader public sphere. If we accept the recent dating of the Anthropocene to the advent of nuclear weapons testing in the mid 20<sup>th</sup> century then, in Nixon's terms (2011 p.232) 'we are all downwinders now.' Every living thing on the planet is entangled with the fallout of the nuclear age collapsing the natural with the artificial and the human with the technological. This condemns us, as a species to new trans-human symbioses and techno-animist intersubjectivities. In the midst of these newly emerging assemblages and endlessly unsettled environments older political and aesthetic models based on the centrality of the human appear moribund.

I am arguing that Smithson's *Spiral Jetty* makes some gesture towards new aesthetic, planetary temporalities that move beyond the human. The work offers a transcategorical model of practice that begins to think, enact and to visualise speed and slowness simultaneously. Attending to the blind spots rendered in the film's use of the sun spot as a material and metaphorical reference point, the work has been resituated to the landscape sites of its production and presentation. In the process this has revealed multiple visual and material references from the deserts of the Southwestern US and beyond that enable opposing temporalities to emerge. The human sensory apparatus both equips and limits us in equal measure from taking account of the profound changes taking place on our planet. Enfolding human and non-human temporalities and materialities to reveal our entanglements with a more-than human world forces us to denaturalise and decolonise the present. The landscapes of the Southwestern deserts have revealed the entangled histories of their indigenous ancestries and advanced technocultural, military and industrial presents, further scrambling temporalities as supposedly 'premodern' intersubjective animist cosmologies coexist with the splitting of the atom and the creation of spectacular and violent 'new' worlds. In the process of assembling these diverse and partial perspectives the deserts of the Southwestern US have emerged as complex and contested cultural and material sites where matter continues to matter in the social and cultural histories under formation in the Anthropocene.

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<sup>i</sup> Previous scholarship on Smithson has also referenced his mixing of categories and disruption of formal coherence in art historical terms. Ann Reynolds for example notes: "Smithson combines things and ideas to reveal fundamental formal and structural connections between categories of thought and images that remain invisible to established hierarchies of interpretation." Ann Reynolds, *Robert Smithson: Learning From New Jersey and Elsewhere*, (Cambridge, MA: MIT Press, 2003), xv. Gary Shapiro also notes: "that there is no primary, authentic object (the spiral) to which the film and the essay are merely ancillary. One could either say that there are three distinguishable but interrelated works that bear that name or that there is one work existing simultaneously in a number of modes." Shapiro, *Earthwards*, 7.

<sup>ii</sup> Elizabeth DeLoughrey. "Satellite Planetarity and the Ends of the Earth." *Public Culture*. 26:2, 2014.

<sup>iii</sup> Catherine S. Fowler. (Cultural Resource Consultants Ltd). "Native Americans and Yucca Mountain: A Revised and Updated Summary Report on Research Undertaken Between 1987 and 1991, Vol 1, (1991), <http://www.state.nv.us/nucwaste/library/se-039-91v1.pdf>

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