

**Time horizon: intersections of deep time and biographical time on the West Shore,  
Stromness, Orkney**

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**Abstract:** What is the significance of a human life in relation to the timespan of the geological processes that shape and reshape the terrain under our feet? Here, we ask how we might think on a planetary scale while being grounded in the everyday, tracing the relationship between biographical time and geological formation. Examining social relationships through the materiality of sandstone, uranium, and concrete, this paper presents a collaborative deep time practice, realised through the iterative process of walking, reading and inscribing a specific site, the West Shore of Stromness, Orkney.

**Keywords:** coast, temporality, geology, stratigraphy, Anthropocene



Figure 1: The West Shore, photograph by Anne Bevan

## **Introduction**

The coastline is a place of movement. It is a place of human traffic tracing the shore for work or leisure; of tides, ebbing and flowing; of the arrival and departure of migrant birds; of the erosion and deposition of geological materials. To recognise the intersection of these rhythms is to navigate vastly different timespans. In this paper, we address the challenge of trying to think between these different temporal registers, exploring the ways in which everyday human movements engage with, depend upon, and enact geological movements, and how sense of place emerges from a relationship between biographical time and deep time.

Calls for a new geologic sensibility, an examination of the “geologic life” (Yusoff 2013) or a “deep time ethics” (Skrimshire 2019, 18) that might adequately respond to the demands of the current ecological crisis, acknowledge the difficulties of framing lived experience within deep time perspectives. Geological movements lie beyond the horizons of

present-day activity. As Ginn et al suggest (2018, 214) “thinking about deep time is challenging; deep time is strange...[and] alienation is perhaps the most logical reaction to sublime, inhuman timescales”. Distributed across space and time, and exhibiting the properties of Timothy Morton’s ‘hyperobject’ (2013, 1), deep time is ‘viscous’, ‘sticking’ to us as human beings, ‘nonlocal’ insofar as we never experience deep time itself, involving “profoundly different temporalities than the human scale ones we are used to”. The recognition of the Anthropocene places humans in the context of deep time by arguing that the impact of human actions are visible at a geological level; yet the challenge here is to recognise this presence “not as distant and abstract but as an intimate and compelling element woven into our everyday lives” (Skrimshire 2018, 223). Our biographies are not only enmeshed in geological time; they are constitutive of it. What we explore in this paper is a collaborative practice which attempts to trace this intimate presence of deep time in the everyday, realised through the iterative process of walking, reading and inscribing a specific site, the West Shore of Stromness, Orkney.

The significance of Stromness’ West Shore as the site for our reflections on movements in deep time emerges in part from its importance in the history of science as a location for the discovery of Devonian fish fossils. In particular, it is associated with the geologist Hugh Miller (1802-1856), whose discoveries expanded human knowledge of the extinct class of fish known as the Placoderm, and informed his best known works *The Old Red Sandstone* (1841) and *Footprints of the Creator* (1849).



**ACROSS - ABOVE - UNDER**

*Tracking...walking, wandering and wondering...a shifting shoreline...*

*Familiar and constantly changing.*

*Drawing attention. Inscribed with the present, with memory, people and stories. According to tides and angles of vision - rocks revealed then hidden; glintan galena and shipwrecked steel, far flung flotsam, plastic inscribed in a babel of languages.*

*Near and Far...Flashing light - houses, buoys and beacons - between Hoy High, Hoy Low and Ness.*

*Entangled lines...time and space collapsed in a moment, deep past, deep future. The same walk but never the same.*

Figure 2: Drawing the Sound, by Anne Bevan

Our route along the West Shore follows Miller (1849: 67) “along the edges of the upturned strata” where he made one of his most noteworthy discoveries – the medium dorsal plate of a previously undiscovered species of *Asterolepis*, a genus of armoured fish extant in the Devonian. (The fossil is now held in the Stromness Museum, and the species has since been renamed *Homosteus milleri*).

Miller held that the Earth was of great age, that it had been inhabited by many species which had come into being and gone extinct, and that these species were homologous; although he believed the succession of species showed progress over time, he did not believe that later species were descended from earlier ones. Such arguments notwithstanding, however, his discoveries within the Devonian sandstone and the books in which they were detailed, fuelled 19<sup>th</sup> century debates about the character of geological time and the development of life within that time, and have been recognised as an influence on Charles Darwin’s theories. Sharing this route, then, with Hugh Miller and with the fossils of Devonian fish gives us cause to reflect upon the way in which geological time protrudes into the present; yet crucially it does so not only through scientific debate, but within the fabric of the everyday. As Miller points out, Orkney is a place where the geological past forms part of the lived environment: “there are few erections in the island that do not inclose in their walls portions of the organic. We find ichthyolite remains in the flagstones laid bare along the wayside... in almost every cottage and fence” (1849: 464). It is to such instances of the everyday encounter with deep time that we attend here.

The sense that the time of geological processes is something radically beyond human experience is clearly conveyed by John McPhee, who coined the term ‘deep time’ in his book *Basin and Range*: “Numbers do not seem to work well with regard to deep time. Any number above a couple of thousand years – fifty thousand, fifty million – will with nearly equal effect awe the imagination” (McPhee 1981: 21). The incommensurability of biographical time and

deep time presents itself as a problem of scale. How can we measure the time of human life against something so vast that it seems to obliterate it? “In the perspective of millions of years, the duration of our lived experience, of ‘our time’, appears utterly inconsequential” (Ingold 1986: 129-130). The provocation of such temporal disparities leads Jeffrey Cohen to write of the inhumanity of geological, remarking that that the love of stone “is often unrequited” in the face of deep time’s “vast duration, slow movement, and inhuman scale” (Cohen 2015: 27). Our life stories seemingly move out of step with the stories of the landforms under our feet.

Yet for all this apparent disparity of scale, walking along the shore we are struck by the unexpected encounters with deep time (Ginn et al. 2018) in the course of the everyday. Orkney has been described as a “deep time zone” (Watts 2018: 143); as the archaeologist Mark Edmonds (2019: 3) remarks, we attend to rhythms of human activity in Orkney within the “long duree of the rock itself... Different kinds of time that cut and circle through each other”. Such encounters enrol the geological within biographical time, while potentially generating awareness of processes occurring over deep time as the material conditions of human existence (Irvine 2014a). The horizon of the present expands through a recognition of the long-term formation on which that present rests. Yusoff (2015: 402) draws our attention to the role of geology within the very composition of the human: a “humanity constituted through the negotiation of nonhuman and inhuman forces”. Here, we recognise that the encounter with deep time can be a crucial site for the formation of social identity and the emergence of possible futures (see also Watts 2018).

The approach taken in this paper emerges from the way that walking “invokes, and in fact gathers together, senses of past, present, and future” (Vergunst 2010: 382). Myers (2016: 85) describes the experience of walking through the remnant of a black oak savannah in Toronto as a process of becoming sensitised to the deep time formation of the land:

“Interested and involved, we are collectively learning to expand and extend our all-too-human sensoria so that we might find ways to pay attention to what happens here.” We take from this the sense of walking as a collaborative practice (Springgay and Truman 2018). Collaborative firstly in the sense of people with different disciplinary backgrounds and experiences learning from one another’s perspective and knowledge, as well as from the expertise and lived relationship of those who live and work in Orkney and know the West Shore well; but also in the sense of attentiveness to those we move alongside, including more-than-human participants in the walk: the land and water, and other species who share it. This is what Springgay and Truman (2018: 136-137) refer to as ‘walking-with’. Our focus here will be on three ‘episodes’ taken from a series of interdisciplinary walks along the West Shore of Stromness, Orkney, culminating in a public walk as part of a ‘Festival of Deep Time’ which took place during Easter 2017. At each stage in our movements along the shore, deep time is experienced not as an abstraction, but something immanent in the landscape protruding into everyday life.



### **Notes from the walk - Janet & Hoi Yeung**

*Man made 'concrete rocks' are used to shore up eroded cliffs. Man over nature? Flint, concrete and burnt plastic pebbles intermingle with natural stone pebble reveal human activities, whether good or bad.*

*Lines and layers and rock formations: Every time there is a different stone which is a tiny microcosm of the bigger geological picture. I specially like the ones like miniature cliffs, layer on layer of history in your hand.*

*Sound, Hoy Sound: some days the boat can be felt from our house before we see it coming round the Kame of Hoy. Strong vibrations. I love the thinking of Deep Time. What we are walking on today and what was before. How soon will the sea be lapping on our doorstep here?*

Figure 3: Walking the Sound, photographs by Carina Fearnley and Anne Bevan



## **Part 1: The Tender Tables**

Walking along what is now the shore, we find ourselves in the midst of a visible record the Devonian palaeogeography of Lake Orcadie. The exposed geology all around Orkney consists of Old Red Sandstone, the fine laminations of which reveal the conditions of its deposition in the massive warm freshwater lake south of the equator during the Devonian period 420 and 360 million years ago (see Brown 2003: 175-179). We see dark clastic (that is, composed of fragments eroded from earlier rock) laminae, recording the accumulation of sediments due to water run-off and river discharge during the wet season, and light carbonate laminae, the result of carbonate precipitation triggered by seasonal photosynthesis during algal bloom (Andrews and Trewin 2010). The effect is a layered ‘calendar of deep time’ recording seasonal conditions. Much more recently, during the ending of last ice age, the sandstone was scarred by the retreat of glaciers. Reading such movements in time along the shore we see a familiar geography and geology emerges from the long-term environmental history underfoot: as Massey (2006) reflects, even in stable landscapes which provide the grounding for identity, the deep time ‘migrant’ histories of the sediments laid down unsettle ideas of permanent changelessness. Hence, environmental archives could be seen as books that can be read through time giving us insights on how landscape has changed, how the climate was or, when exploring the most recent past, how we humans have related to our natural surroundings during millennia.

But if this is a record of deep time, it is a record upon which people literally make their mark. Archaeologist Antonia Thomas has conducted fieldwork and survey of a number of stone-carved graffiti sites throughout Orkney. One of these sites of mark-making is the section of cliff near Billia Croo on the West Shore known as ‘The Naming Stone’, where in

the 18th century, quarrymen of the Black Craig quarry carved their names into the flagstone of the geo. She notes that by the 19th century the quarrymen were replaced by tourists equipped with hammer and chisel, satisfying new appetites for travel and geology, and encouraged by the “romanticising [of] the Highlands and the Islands”. These later graffiti were, as Thomas observes, “declarations of identity in a new age of literacy and leisure” (2016a: 40). Thomas also notes how, at the same time as 19th-century geological tourists were chiselling their copperplate into the rockfaces of Orkney, the term graffiti was first used in English to describe much older markings at Maeshowe (Thomas 2016b: 75).

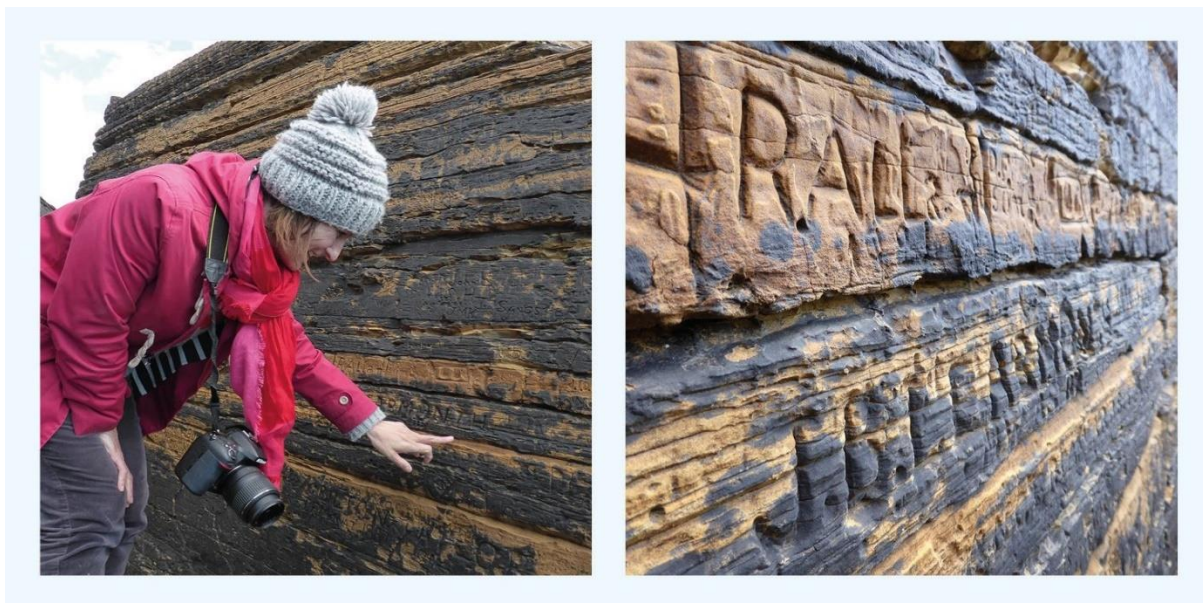


Figure 4: Antonia Thomas at The Naming Stone, photographs by Anne Bevan

Name-archives such as those at Maeshowe or ‘The Naming Stone’ may be common everyday inscriptions, but they are important for what they reveal about individuals, communities, and historical moments. The area of the West Shore closer to Stromness and known as the Tender Tables is also replete with graffiti from the 19th and 20th centuries. Local names like “Mowat, 1883” occupy the same stratigraphy as much later lovers “B&D” who at some point in 1961 inscribed their initials and a heart into the rockface. Part of the vernacular of the shore, the chiselled marks seem out of scale and place, writ large as they are

across narrow laminations of the rock that represent much longer time horizons: “narratives applied to surfaces where they do not naturally belong” as Lovata and Olton suggest of all graffiti (2015:73). This is perhaps indicative of a deeper human, or at least modern Western, impulse to leave a signature on all things, much as we envisage that we are now leaving our mark in the current geological strata of the Anthropocene. As with all signatures, the flagstone carvings operate as the indexical trace of an author who was present at the time of writing, and conversely as a guarantee of, and in, their absence.

Thomas (2016a: 41) cites Hugh Miller’s account of carving his name into the famous Dwarfie Stone on his trip to Orkney where he describes his attempt to “beguile the time” with his own signature, which, he hopes will, along with others before him, be “legible two centuries hence”. Miller ponders the “state” of this future “world” and “what sort of ideas will fill the head of the man who [may] decipher the name for the last time” (1858: 514). Whether simply whiling away time, or tricking time to stave off mortality by inscribing his name into the rock, Miller’s graffiti expresses the human desire to make our brief existence legible in the overwhelming vastness of geological time. The accretion of names and dates carved on the flagstone at Billia Croo and the Tender Tables shows the material trace of communal activity as well as individual moments. They are a record of the generations who came here to work, to swim, to discover the geological secrets of Orkney: biographical time cuts across deep time, reminding us of the strong sense of place generated by the West Shore and the Tender Tables.

Generations of Stromnessians learned to swim at the Tender Tables long before the Stromness Swimming Club was established in 1957 at Warbeth, or indeed the indoor swimming pool opened in 1969. In a prose piece published in *Northern Lights*, the Orkney novelist and poet George Mackay Brown recalls childhood memories of summer afternoons in the 1920s and 30s warming “feet in the rockpools before plunging into the Sound”. He

remembers it as a “place of early childhood”, “children’s territory”, to be abandoned in adolescent years as he and other boys “wanted nothing to do with adults or girls” (1999: 63), although the numerous pairs of initials inscribed in the adjacent rockface suggest otherwise.



***Tender Tables - The Women’s Bathing Shelter***

*1940...Mum learnt to swim here...remembers the chill of Hoy Sound in late Autumn...teenage boys teasing, peeping from the golf course road behind.*

*Out of sight, trying on new skins...Then the MOD mistook it for the military and ‘made it safe’ in a controlled explosion.*

*Exposed. Cast concrete conglomerate – lime, sand and pebbles – tumbling and returning to the sea.*

Figure 5: The Women's Bathing Shelter, by Anne Bevan

The Tender Tables is a “curious name”, of unknown origins, as Brown observes. The tables likely refer to the flat expanse of large slabs of sloping stone punctuated by rock pools

that provide a place to sit, swim and picnic at the shoreline. He notes that “tender” is not in Hugh Marwick’s dictionary but suggests that its origins be left to Norn scholars to decide upon (1999: 62). A more recent Orcadian poet, Morag McInnes, situates the origins of the place-name in a child’s understanding of language: “Tender / meant love; and tables / meant sums, so I thowt / it was a place full o / friendly counting.” Her account in the poem “Swimming Club at the Tender Tables” from *Street Shapes*, is associated with memories of school: mathematics, reading, and “two minutes swimming” followed by “half an / hour / chitterybiting, scratching the tang / oot o your bits” (2014:10). McInnes’ snatches of time and Brown’s “long summer afternoons that went on and on” (1999: 63) form communal narratives of place from selectively edited moments of human experience. Glitches of human time are set against the vast inhuman time of the stone tables, which must necessarily defy permanent inscription despite these writerly efforts to produce a “geological romance of origins” (Heringman 2004: 30) based in the language of childhood or of ancient Norn.

Just as a signature inscribed in stone can only attest to the absence of the person who left it there, the enduring presence of the Tender Tables underlines the partiality of human time in the form of memory, and the loss of access to an individual and collective past. “Memory plays tricks” as Brown observes (1999: 63); and all the while, the action of water on stone unsettles the familiar and everyday, a sense conveyed in a passage in Brown’s novel *Beside the Ocean of Time*: “A wave in the Sound – one of those seventh waves that comes in higher and colder and more rampant than the six ordered predicable waves on either side of it – crashed against the round ancient ruin on the shore, and carried away another loose stone that had stood for twelve centuries. That stone would trundle here and there with the tides, flung back and fore in the mill of ocean for a few decades, growing smaller and ever more spherical, until it was at last a scattering of sand among the oyster grains and the grains of

crab and cormorant. A hundred years on, and a child might be building a sand castle on the edge of the tide, on a summer afternoon” (Brown 1994).

Elsewhere, Brown reflects on sitting “for an hour or more among the rocks between Nethertown and the Tender Tables”: “How hypnotic it is to watch the slow insurge of the tide: time is withdrawn; the behaviour of the encroaching sea is fascinating and unpredictable.” (1975: 18). This description echoes T. S. Eliot’s “Dry Salvages” (“Here between the hither and the farther shore / while time is withdrawn, / consider the future and the past with an equal mind.”). The Dry Salvages is a formation of rocks off the coast of Cape Ann, which Eliot visited as a boy and returned to as an adult. This section of Eliot’s Four Quartets set on the Massachusetts coastline, meditates on the temporality of the sea, which is “not our time”, but the time of eternity that precedes the past and future of linear human time. For Brown as for Eliot, time is inherently spiritual; chronological time is redeemed by the continual eruption or “insurge” of the eternal in the present. Reflecting on the deeper patterns of time found at the shoreline, where tide wears against rock, enables a different orientation of human life to the distant past and seemingly far-off future. Brown understands this as the paradox of experiencing eternity in the present moment, whereas walking together along this same Stromnessian shoreline, we reflect on the incommensurability of human life with deeper geological time, as it is revealed in the landscape around us. Yet the accretion of names and dates carved into the varves alongside the Tender Tables attests to the place of the fleeting present within, and not alienated from, these geological spans.



*Image, reflection, shadow...Casting & printing Lake Orcadie. Thinking of the sea, and the sea bed, as inversion...Inside out, upside down...What is now land, used to be sea...Waves, wind and weather sculpting shoreline sand and seabed. Then to stone, to rubber, to plaster, to concrete...Back and forth.*

*Silvery sea: Galena Sound.*

Figure 6: Casting the Sound, by Anne Bevan

## **Part 2: Radioactive arrivals**

The first time we walked together along Stromness' West Shore, [AUTHOR] shared a story from her childhood. She remembered coming down to the beach here with her dad to collect the seaweed that washed up on the shoreline. The seaweed was destined for the garden, to be used as fertiliser. However, that night the local news warned of dangerous levels of radioactivity had been detected on the shore – waste material washing up along the coastline from the Dounreay nuclear power station over the Pentland firth. Seaweed is a known accumulator of radionuclides; so any found along the coast had a high probability of contamination. If it was used as fertiliser, the nuclear waste would find its way into the food chain. And so, that season, the seaweed never made its way onto the vegetable patch.

This memory of a radioactive arrival on the shore echoes that of a much earlier arrival, when the ground under what is now Stromness was forming at the margin of the massive freshwater Lake Orcadie. Devonian sediments shed from metamorphic rocks containing a number of heavy minerals, which were then sorted by the action of the sea, creating a concentrated 'placer deposit' of Uranium within Orkney's Old Red Sandstone. There it rested for hundreds of millions of years. Until another arrival: in 1973, when UK Atomic Energy Authority geologists published the results of a reconnaissance for uranium. The prospect that uranium mining in Orkney might prove economically viable led to South of Scotland Electricity Board carrying out exploratory drilling in 1976 to establish the extent of the deposits (Michie and Cooper 1979). It is here that the story of Orkney's geological history intersects with Orkney's political history. Uranium, whose presence reveals a story millions of years in the telling, had now arrived on Orkney's shores as a political issue.





Figure 7: ‘No Uranium’, photograph by Keith Allardyce, courtesy of Stromness Museum and the estate of Keith Allardyce

The threat of mining – and the extent to which Orcadians could exercise self-determination in order to resist it – came to dominate campaigning in Orkney both for the 1979 Scottish Devolution referendum and the 1979 General Election. On 21 March 1979, over a thousand people turned out for a silent demonstration in Kirkwall, expressing the determination that the Uranium should be left in the ground. The following week, Orkney residents debated with representatives of the electricity board in a five day public enquiry, at which the Orkney Islands Council declared that Uranium would mean the economic ruin of Orkney, destroying the islands’ four main industries of fishing, farming, tourism, and whisky distilling.

Many of the people we spoke to during our fieldwork in Orkney emphasised the way in which the Uranium controversy transformed the political landscape. Meeting with a former

councillor, he described the history of Orkney as “finding the potential manifest in the stone” – clear as far back in Orkney’s history as the innovative stone structures of the Neolithic (see also Edmonds 2019). Uranium, he explained, was another potential manifest in the stone – but a potential for whose benefit? It was this specific issue that politicised him, bringing home the need to “safeguard our future” and give Orkney power over its own destiny, and so encouraging him to join the ‘Orkney movement’ which drove for greater devolution and constitutional autonomy for the islands.

Memories of this time recall the way in which Uranium controversy transformed the political landscape. It generated an urgent sense of Orkney’s need to look out for its own interests, as distinct from those of London or Edinburgh, and brought people together in a common cause who had previously been in conflict. In particular, this was a key issue transcending the ongoing tensions between islanders and incomers who had arrived seeking an idealised life (and in doing so, some felt, had undermined the very way of life that had drawn them there; see e.g. Forsythe (1980) on conflict between Orkney islanders and those arriving from south). As was written in an editorial in *The Orcadian* 29 March 1979: “what however was most significant was the utter dedication of a few Orcadians and ‘naturalised’ Orcadians to fight the good cause, among them people who have often been on opposite side in previous local issues”. Indeed, Uranium changed the course of people’s individual political biographies. Some who had previously had no interest in politics at all found themselves ‘awakened’ by the Uranium issue. Many who were schoolchildren at the time describe the events as formative, recalling the almost carnivalesque atmosphere of the protests against further exploration that would lead towards the mining of Uranium: the joy of ditching school, the spectacle of people lying in the road to prevent vehicles and equipment involved in the prospecting being unloaded from the ships, the determination that the land would not

be despoiled by a ‘poison mine’ (to use the vehement description offered to us by one resident of Stromness).

The apparent mismatch between biographical time and deep time presents itself as a problem of scale: our life stories seem to be hopelessly, impossibly out of step with the stories of the landforms under our feet. But here deep time protrudes into the particular present of our human lives.

As Ferry and Limbert (2008: 3) remark, “resources, resource-making, and resource-claiming are entangled with experiences of time”. This is not a passive process, determined by the deep temporality of the landscape, nor a process of social construction, but an interaction (potentially, as suggested above, a dialectic) between temporal rhythms. In this arrival on the shore, different temporalities intersect: human life history; geological formation; the half-life of radioactive material. To grasp what is happening in the present requires thinking about times that reach into the past, and fan out well into the future – a point which Ialenti (2020) makes clear in relation to the deep time afterlife of nuclear waste. As was explained in a feature in *The Orcadian* of 29 March 1979, tailings from mining would remain radioactive for 80,000 years: “We would bequeath covered piles of them to future Orcadians with instructions how to avoid them and how to keep the fences repaired. I must say the thought of communicating warnings to Orcadians living in the year 5000 daunts me, but 80,000 years hence!”

Returning to the shore and our walk among the seaweed: we are reminded of previous work in collaboration with the archaeologist Jane Downes (Bevan and Downes 2018), exploring the folklore of the Nuckelavee, the dreadful devil of the sea: skinless, fleshy innards of human fused to the fleshy innards of a horse; slimy, oozing, bringing a plague upon the islanders. According to the Orkney farm owner and folklorist Walter Traill

Dennison (1891) it was the burning of seaweed tangles that threw Nuckelavee into a rage. The potash-rich product of this kelp burning (a major Orkney industry from 1722 onward) had lucrative uses in the glass and soap industries; but the choking flames from the burning enraged the Nuckelavee and threw him into a fury which he took out on the islanders in the form of plague. Thinking about the radioactive seaweed, we're reminded of the story and its horror as it resonates with more recent nuclear anxieties: what washes up on the shore as economic opportunity and choking poison, opportunity and destruction.

In 1980, shortly after becoming Prime Minister Margaret Thatcher visited the islands to reassure islanders that the idea of mining Uranium had been put in "cold storage"; "For the moment, we have enough to meet our needs." Yet 'for the moment' still carried with it a sense of threat. As George Mackay Brown wrote in a letter in the wake of Thatcher's visit: "The Uranium is slumbering among its rocks... What will Stromness be in fifty years' time?" (cited in Fergusson 2006: 223). The potential of the Uranium's deep time emerges into the present and does not go away.

### **Part 3: The Anthropocene Bedding**

Along the West Shore are the remains of World War I and II defensive structures. Built as artillery and searchlight emplacements, now they are places to shelter out of the wind and rain. If the bottles appearing there are anything to go by, they are places to pass a drink around while looking out over the sea. As historic sites, they stand testament to a time when concrete played a key strategic role securing the natural harbour of Scapa Flow as the Royal Navy's principal naval base.

Earlier histories are visible within this concrete, too. As we walked with Andy Hollinrake, caretaker of the Ness Battery, he showed us pink colouration within the concrete,

indicating the aggregate used contained granite from the basement rock which underlay Orkney prior to the deposition of the Old Red Sandstone (and thus considerably older than 416 million years). Concrete is part of the geological sequence here, but such a sequence is never purely linear; it reaches back into itself for materials and disrupts itself with discontinuities.

The presence of concrete on the shore today can appear stark. Amidst the sandstone, it sticks out like a sore thumb, an obvious and disproportionate mark of very recent human presence superimposed on millions of years of gradually accumulating geological history. Yet, crucially, it is within this geology; part of it, not alien to it. Indeed, as Andy also explains to us, during wartime, stone was scattered on the roofs of the emplacements to break up the shape and allow them to blend into the coastline from above; making their human-made identity as military structures less obvious made them less vulnerable to enemy bombing.

Today, the role of concrete in defending Orkney is as vital as ever. The action of the sea is constantly reshaping and reducing the islands, a continuous gnawing eroding the glacial till and the underlying sandstone. If coastlines are sites in motion, revealing environmental variation over time, they are also sites of anxiety about that motion (see also Irvine 2014b). As Orkney finds itself reduced year on year, the coastal built environment finds itself threatened. A particular source of concern is the loss of sites Orkney's unique Neolithic, Iron Age, and Viking heritage, a problem likely to be exacerbated by climate change (Gibson 2008; Day et al. 2019).

It is here that concrete acts as Orkney's protector. On the West Shore, concrete defences punctuate the coastline. From one perspective, they seem to interrupt the geology of the shore. The laminations of the sandstone, records of accretion over millions and years,

seem to stop and start as the concrete interjects. Concrete's presence in the calendar of time revealed by the stratigraphy of the sandstone is ambiguous: it is part of that calendar, but at the same time seems to obscure it, and to hold it in suspended animation. Here, concrete mediates transience and endurance (see also Simonetti and Ingold 2018).



Figure 8: Pillow Rocks, photograph by Anne Bevan

Yet the concrete along the West Shore shows its own processual history. Different attempts have been made to secure the coast with concrete at different times: concrete blocks cast separately and placed in gabions; concrete cast in situ. And this concrete bears the traces of the process materials used to shape it. The timber framework used to cast concrete leaves the impressions of grain running across the seawall, like an expanse of wooden panelling, while hessian sacks filled with cement and left to plug gaps waste away in the sea water, leaving only their impression in the solidified cement (and occasional threads of sacking in the

crevices). In many locations, the concrete laminations follow the same bedding as the flagstone, implying a human participation in the geology rather than a contradiction of it.

To further examine the interaction between the natural geological strata and the anthropogenic interferences to this sequence to preserve the coastline, one outcome that arose from applying our disciplinary insights during our walks was the desire for a traditional geological cross section with a difference. The aim was to treat the anthropogenic ‘geology’ as a geology ‘proper’ taking measurements of the traces within the concrete, the angles of the gabions and stacks of the hessian textured concrete pillows, and the dips and strikes of concrete slabs. By not distinguishing between the ‘natural’ and human created features it facilitates a fresh perspective on the relationships between them, their bonding and integration, and the temporal aspects of their processes of formation.

A geological cross section is a graphical representation of vertical slices through the earth that gives a vertical rather than horizontal perspective of the landform. Like cutting a cake you get to see inside the different strata, their compositions and angles (the dip and strike), and to determine what forces may have formed that particular geological section. Typically, cross sections show the different types of rocks, their constitution and internal structure, and the geometric relationship between. It is this approximate model of the real distribution of the rocks in depth that enables geologists to better reconstruct the stratigraphy of the deep past, and hence obtain better insights into the environment of deposition / formation, the tectonic forces (large and small), and the timescales involved. A cross section therefore takes a slice through the rocks from a point ‘A’ to B’ to provide this information, and are frequently the basis for engineering works, and the exploration and production of geological resources (e.g. minerals and energy). Figure 9 shows the cross the section drawn at the Noust of Nethertown.

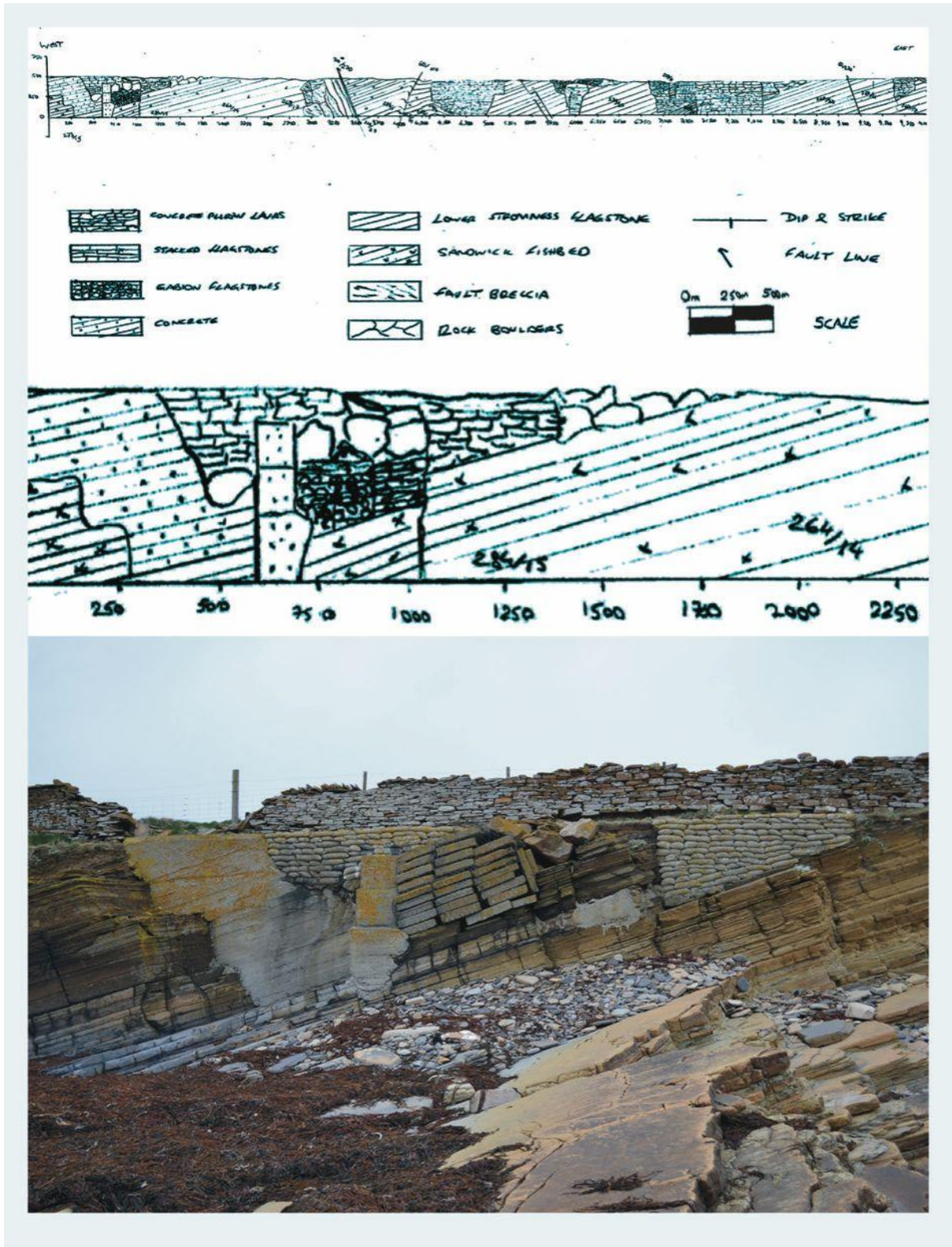


Figure 9: Anthropocene Bedding, section drawing by Carina Fearnley, photograph by Richard Irvine



To construct the map a number of steps are taken: i) select the cross section, ii) draw the basic framework of the section for scale: the x-axis represents the length of the cross section to scale, and the y-axis has a relevant scale to the topographic contours, iii) measure the length of the various outcrops and mark them along the x-axis, iv) using dip and strike measurements taken in the field, plot the angle the rock is dipping at (largely used for sedimentary rocks that have numerous beds), the strike (direction it dips towards) is noted by a measurement from 0-360° (relative to the North pole), v) by measurement, the various bed boundaries can be carefully extrapolated by tracing dips (drawn at the same angle on the cross section), vi) add in fault lines drawn at the dip angle. The differing lithologies are coded by symbols and in Figure x above, given names. In addition to the established geological names of 'Upper Stromness Flags' and 'Lower Stromness Flags', are 'Rock Boulders', 'Concrete', 'Gabion Flagstones', 'Staged Flagstones', and 'Concrete Pillow Lavas' (the hessian textured concrete pillows). This is an attempt to co-opt geological terms for anthropogenically generated lithologies. This method is a conventional way of drawing a cross section, now commonly generated using computer software. The purpose of generating this cross section was to recapitulate the hand drawn quality of geological cross sections as often seen in nineteenth geological mapping, intersecting this historic analogue form with speculative Anthropocene lithologies.

In summary, the cross section enables a closer examination of the interrelations between the natural and anthropogenic materials as they jostle and erode at different rates. It forces us to acknowledge the brutal methods of emplacing many of the defences, and the damage done in particular to the fish beds – the strata of fossils of Devonian life. As gabions cut through lithologies, and cement smothers the formation, millions of years of environmental change captured in the grains of sand that tell stories of the atmosphere, the lake, life, and also of the annual depositions such as sunspot periodicity (~11 years) and

astronomical cycles (Milankovitch cycles that are over 100,000 years long) (see Andrews and Trewin 2010), are all obscured by the concrete. What is added to the history is a temporary, provisional attempt to hold back the very forces that have shaped the rocks covered by these concrete interventions, demonstrating a fundamental human naivety about our capacity to protect our way of life, and prevent the landscape from changing.

This is Orkney's Anthropocene bedding. It challenges us to pay heed to the fact that we are living in a geological epoch of our own making. The search continues for the most appropriate stratigraphic marker indicating the presence of the Anthropocene in the geological record. Concrete is surely a good candidate. As some members of the Anthropocene Working Group have argued, concrete is a conspicuous reminder that humans have made a significant addition to Earth's inventory of rock types (Zalasiewicz et al. 2014), and so, alongside plastic, may serve as a lasting trace fossil of human activity. As with the plastic that washes up on the shore, in concrete we see the recomposition and redeposit of geological materials from Earth's history to serve the immediate needs of the present. Both plastic and concrete are material manifestations of major human interventions in earth systems; what is striking about the use of concrete here is precisely its use to try and mitigate the effects of those interventions.

The route we take along the West Shore – a route which would otherwise be eroded – is held in suspension by geological interventions that seek to fix the landscape and restrict the effects of flux, inflating humanity's short timespan on the deep time of earth's planetary history by perpetuating the present. But in its use for such a purpose concrete also projects that impact forward in time: production of cement for concrete is one of the biggest contributors to human Carbon Dioxide emissions. The use of fossil fuels to heat the kilns, along with the direct release of Carbon Dioxide in the breaking down of Calcium Carbonate, is believed to responsible for 8% of anthropogenic carbon emissions (Lehne and Preston

2018). When we consider the sea defences at Orkney, then, we see a particularly egregious feedback loop: our attempts to secure the land/water boundary necessarily contributes to the climatic changes which threaten those very environments.

Zalasiewicz et al. (2014) describe concrete as a “technofossil” – trace fossils not only of the human species, but of rapid technological acceleration enabling major anthropogenic modification of earth systems. Recognising concrete’s presence as a technofossil of the Anthropocene – that is, a future fossil of the material consequences our current way of life (see also Farrier 2020) – we find it juxtaposed with the Devonian fish fossils that Hugh Miller sought along those shores. If these fossils index the past, concrete-as-fossil indexes that which is to come: the mark of humanity left for the future. Yusoff (2013: 789), invites us to place such sets of fossils in conversation with one another, arguing that “the fossil... is an abandoned being that suddenly in the midst of the present reconfigures the possibilities of lives, of past and future”. Hugh Miller recognised the signs of mass mortality in the fish fossils found within Orkney’s Old Red Sandstone. “Some terrible catastrophe” had occurred in Lake Orcadie, leaving “the marks of violent death... The figures are contorted, contracted, curved... the spines stick out; the fins are spread to the full, as in fishes that die in convulsions” (Miller 1841: 237). As a mark of the catastrophe of a past age the fish fossil calls on us to consider human life in the context of extinction. Yet Miller writes with a providential view of history: we should not read evidence of past extinctions as a sign of our likely future. “The animal existences of the previous ages formed if I may so express myself, mere figures in the landscapes of the great garden which they inhabited. Man, on the other hand, was placed in it to ‘keep it and dress it’”. The concrete obscuring the fishbeds at the Noust of Netherton may indeed be seen as a sign of our management of the planet – yet considered in conversation with the extinct fish, concrete-as-fossil calls on us to locate our present in the anticipation of a deep future. To map human presence within the geological

cross section, then, “is itself a memento mori ... a reminder of our incipient minerality” (Szerszynski, 2012: 181).

## **Conclusion**

Deep time, for all its vastness, becomes intimate when we trace it in places and things that are familiar. As David Farrier (2020) has argued, it is a spectral presence in the everyday – and our everyday lives will leave their own traces in the deep time of the future. This is what we set out to trace along the West Shore of Stromness: the presence of the geological in the everyday, linking biographical time with deep time through exploring its manifestation in the space generated by the various human and more-than-human agents that we encountered there. Yet sense of place is not without interruption (Dixon et al. 2016), and such relationships are not always consonant; indeed, they can have the character of disjuncture.

The selections from these encounters presented give some sense of the materiality of relationships with geological temporality. The varves of the sandstone, and the graffiti carved across them, reflecting the character of specific seasons, specific moments. Memories entangled with the timespan of the formation that led to these particular forms – the reflective nostalgia of time spent in the presence of oceanic vastness. These expanded time horizons inform an identity which can have political agency; indeed, in Orkney they can be crucial to the negotiation of possible futures (Watts 2018). We see this demonstrated through the encounter with the deep time of Uranium’s formation and the haunting afterlife of its extraction, and the way that this transformed the political consciousness of a generation. Finally, we focus on the place of concrete in the stratigraphy – Orkney’s Anthropocene bedding – to bring into focus human presence in the Geologic Time Scale. Our reliance on

concrete for the continuation of our present way of life in spite of the long term atmospheric effect of its production is evidence of the close proximity of our economic time horizons. As unconformity, these concrete interventions serve as a monument to human geological agency.

Developing a collaborative practice walking with deep time required walking in the footsteps of naturalists, geologists, writers, quarrymen, lovers, children, who had inhabited this landscape and created their own deep time stories. It also meant tracing and retracing our own steps, reading the shoreline and inscribing it with our own disciplinary insights as we walked together – anthropologist, literary scholar, artist, geologist. In doing so, accompanied by the ebb and flow of the shore and surrounded by the different rhythms of the coastline, we sought to reveal and also to amplify everyday deep time encounters among various objects – fossils, human researchers, graffiti, cement, chisels, poems. As we move, the coastline shifts, the horizon recedes.

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