

Interactive comment on “Boundary|Time|Surface: Art and geology meet in Gros Morne National Park, Newfoundland, Canada” by Sydney A. Lancaster and John W. F. Waldron

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Thank you for your helpful comments and review of this paper. We suggest some revisions we might make below.

I wonder why the authors state only that they intend to interrogate the human practice.

Response: We will add to the abstract (where this phrase occurs) a clearer indication that human practice includes scientific activity. We will also change the metaphorical “interrogate” to “draw attention to” as this is our more literal meaning.

Why not also look at the natural forces that created a situation where it was logical to

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place a system boundary? Overall, in their focus on humanity and on the interpreted colonialism of pioneering geologists, they gloss over the extent to which the recognition of geological boundaries in the modern world is driven by the rocks themselves, and what they tell us about the changing world.

Response: we will add sentences to section 2.3.2 to give a more nuanced explanation of the different factors that have led to the location of boundaries, including the examples raised by the referee: the Cretaceous-Paleogene, Permian-Triassic, and Ordovician-Silurian boundaries, to highlight the combination of geological and pragmatic considerations that go into the placement of boundaries. Our proposed addition is as follows

‘In some cases, such as the Cretaceous-Paleogene boundary, the traditionally identified horizon marks a sudden global change that is easily correlated worldwide. In other cases, such as the Permian-Triassic and Ordovician-Silurian boundaries, major global change occurs over an interval within which correlation is challenging. For pragmatic reasons, the Permian-Triassic boundary stratotype at Meishan, China, was therefore placed in the an interval with cosmopolitan fossils in the interval marking the first recovery from a major extinction event colloquially termed the “great dying” (Ord, 2012). Similarly, the Ordovician-Silurian boundary at Dob’s Linn in Scotland is placed in black shales with abundant, well-described graptolites, somewhat above an interval of grey beds, lacking abundant graptolites, that records the “Hirnantian event” of global change to biotas (Cooper et al. 2012, Melchin et al. 2012).’

The Green Point boundary is not the same boundary that was erected by 19th century British scientists; rather, it is the outcome of 20th century international negotiation, and of collaborative efforts by people from many countries to understand past global events.

Response: We do feel that the text at the start of 2.3.3 makes this clear. Hopefully the additional context provided by the previous addition will help to bring this out.

Even though the process of selection of global stratotypes is discussed near the end of

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the paper, it may be that the overall focus on colonialism and the imposition of human will on the world is not a particularly good fit for the particular boundary to which the art was applied.

Response: We believe that its choice is now better justified with the above additions to the text, which highlight the varying factors in play in the choices of stratotypes.

Also, how does the work interrogate this human practice? Although this is brought up various times through the paper, it is not clear to me how the work really does this. Still, it is/was a beautiful and intriguing piece of landscape art.

Response: We are glad that the reviewer found the installation both beautiful and intriguing, which was what we hoped would be the experience of viewers. We will modify the figurative “interrogate” to the more literal “draw attention to”. In addition we will add several sentences within the text that highlight how this was achieved by the position of the structure within the relatively uniform succession of strata in the boundary interval.

The authors state (lines 388-391) that “The original work and the various methods of communicating the experience of its brief existence is an ongoing project to destabilize the fantasy that humans are somehow separate from the Earth (Boetzkes, 2010, p.18), its systems and timescale – and the notion that borders, boundaries, and other forms of territoriality are somehow permanent”. This may be true for some systemic boundaries, since several of them are quite arbitrary, but there are others (the K-Pg is the most obvious example, but the O-S is another) that stand out “like a fish in a tree”. The boundaries that are placed at mass extinction horizons are, indeed, permanent - they impose themselves on the viewer, rather than the other way around.

Response: This is certainly true for the K-Pg boundary, where the biological change is extreme and seems geologically instantaneous; we will adjust the text to provide the more nuanced perspective as suggested by the reviewer. We do note that at other boundaries that mark major global change, for example the O-S boundary mentioned by the author, and the P-Tr boundary that marks the end of the Paleozoic, the situa-

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tion is not quite so clear. The boundary commissions have struggled with somewhat conflicting aims of marking the point that stands out by reason of most rapid change, and choosing a pragmatic stratotype that allows the most easy correlation to a well-studied and continuous section. Pragmatism has generally won out. For example, if memory serves, the peak of the Ordovician-Silurian Hirnantian event, interpreted as a major extinction driven by climate change, is typically marked in deep-water successions by grey beds in which graptolites are rare, in contrast to the black shales above and below. The eventual choice of stratotype, at Dob's Linn in Scotland, was slightly above the Hirnantian grey beds, in a section with better documented graptolites. Pragmatic considerations thus played a role in the final selection of the GSSP near to, but not at, an episode of global change. Similarly with the Cambrian-Ordovician boundary, the most obvious biosphere change was the advent of planktonic graptolites with *Rhabdinopora flabelliformis*. However, the boundary was eventually placed lower in the section between two very similar conodont species, because this provided better correlation. These factors are now discussed in added sentences at the end of section 2.3.2 (see above).

There is a lot of information on the technical aspects of constructing the artwork, but I wonder about other things the authors might have done in addition to the recording that was carried out. Did they consider virtual reality 360 photography? This would certainly have brought the record closer to the actual piece, reducing the suggestion that documentation is an ‘edited version’ of what once existed. If VR was considered, why wasn't it used?

Response: While we considered more advanced technology, neither VR nor 360° photography could be implemented due to financial constraints, including access to both equipment and expertise. (The residency at Gros Morne provided a basic stipend but no funding for equipment, some of which was borrowed from the Park.) The original project was undertaken in 2014, at which time these technologies were not as well developed or accessible as they are in 2020. From a philosophical and artistic point of

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view we would contend that regardless of the method, documentation of site-specific work is unavoidably a 'translated' view of the original, as choices will be imposed both by the hardware and by the perspectives of those capturing and editing the images. More recent VR presentations we have seen in art exhibitions, while impressive, have not been the same as being in the real landscape; much of the artistic impact of VR stems from the degree to which they are selective representations of the real world.

Similarly, in this modern world, why was there not a web version? Gallery exhibitions, talks, and a book are all very traditional and "niche"; an online presence could have reached (or could still reach) a much larger, global audience. It might have also generated more audience engagement and response. The video installations seem as though they could have been very effective - I wish I could have seen them. Are there any thoughts about posting these to the web?

Response: Video documentation of the exhibitions has been shot, and could eventually be made available on the web. An important consideration is that working artists, without permanent positions in academia, galleries and museums, must retain some control over the distribution of their work in order to have any possibility of generating income. Galleries expect the material presented to be unique and not simultaneously available on the web. Nonetheless, samples of the graphical and video material are available at the web site of the first author; we had refrained from promoting these in the paper lest it be seen as an improper use of this medium.

Specific Comments Line 35-40 - What was the island called by the Beothuk? The Beothuk name, if known, should probably take precedence over all subsequent names.

Response: We agree completely; research we have conducted to date has provided no indication of what the Beothuk called the island. The extant wordlists date from the 19th century, and are records of common nouns, numbers, and the like recorded from some of the last living Beothuk. We would welcome input from others on this point.

2.1 Social and cultural context - This discusses the idea of boundaries as constructs

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of humanity, but ignores the fact that many boundaries are also natural features. In space, boundaries between countries or territories are often rivers or coastlines. In geological time, boundaries are often placed at very distinct geological event horizons - the Cretaceous-Paleogene boundary would be the best-known example of this.

Response: While there are most certainly socio-political boundaries constructed along natural features, there is no absolute necessity for that to be the case in human relationships; it is a matter of pragmatism, negotiation and sometimes coercion. Likewise, these human-defined boundaries can be redefined repeatedly over time, as part of process of colonization and war (an excellent example can be found at <https://www.youtube.com/watch?v=UY9P0QSxInI>).

Line 140 - The way this is written, it suggests that the Silurian-Devonian boundary is still at the Ludlow Bone Bed - maybe add a word such as "initially" or "originally" to "placed at the Ludlow Bone Bed".

Fixed.

Line 204 - What equipment was used for photography and videography?

Response: We will supply a complete list of all equipment used as an appendix to the paper.

Line 345-350 - In discussing our inability to truly comprehend the vast extent of geological time, it might be useful for the authors to circle back to the role of boundaries in understanding this time. Any glimmer of understanding that we now possess is largely the outcome of that exercise of defining geological periods and the boundaries between them.

Response: We will insert a reference to the exercise of dividing geological time in this discussion:

"We have the option (and the choice) to reduce this impact: exploring the human relationship to geological "deep" time, and the widely spaced markers we have placed

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within it, can be the basis for reevaluating what kind of animals we are, our relationship to the Earth.”

Technical Corrections Abstract, Line 29-31 - wording reads as though the public are a range of visual media

Fixed

Line 72 - Add space between “thus” and “far”

Done

Line 87 - Try to rephrase, to tidy up usage of “which” and “that” - refer to a style guide for appropriate usage.

Done

Line 121 - Fix punctuation - at the moment it reads as though Sedgwick’s father was elected to the Woodwardian chair.

Fixed

Line 219 - Is “dissolution” the best word for what happened to the installation? It was destroyed (disarticulated and abraded), rather than dissolved.

Changed to destruction

With thanks, Sydney Lancaster & John W.F. Waldron

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