

**Ialenti Vincent (2020) *Deep Time Reckoning: How Future Thinking Can Help Earth Now*. Cambridge, MA: MIT Press. 208 pages. ISBN 9780262539265**

*Antti Silvast*

*antti.silvast@ntnu.no*

Some energy policy choices have implications for decades into the future. Some choices have impacts centuries, tens of thousands, or hundreds of thousands of years from now. How can current planners know what these impacts will be? Vincent Ialenti's book *Deep Time Reckoning: How Future Thinking Can Help Earth Now* examines professionals that forecast far-future geological, hydrological, and ecological events in nuclear waste storage. His fieldsite is in Finland: a country famous for its nuclear power programme and as a host for the world's first anticipated deep geological nuclear waste repository, called Onkalo. This is a disposal option where the spent nuclear fuel is stored deep underground inside the Finnish bedrock. Onkalo is to open in 2023-2024 and contain the nuclear waste during the hundreds of thousands of years to come.

*Deep Time Reckoning* studies deep time: timescales that concern geological events at much greater than human timescales. Ialenti writes not primarily for an academic treatise but for the educated expert and lay publics. He presents nuclear waste disposal to facilitate learning - i.e. "deep time reckonings": Ialenti deems these reckonings crucial at a moment when societies face a dual crisis: an ecological crisis and a putative intellectual crisis, a "deflation of expertise", which indicates a generalised mistrust of expert authority and knowledge. The Finnish nuclear management expertise and its long perspectives - "the world's most long-sighted experts" (p. xiv) - offers fresh insights in this situation.

The book is empirically vast, including fieldwork that lasted 32 months (2012-2014) and covered 121 informants from nuclear waste management and its public regulation to research, companies, NGOs, and politicians. As an anthropologist, Ialenti adopts the famous maxim of "following the actors" and treats his informants as "humans with dreams, hobbies, anxieties, hopes, frustrations, quirks, passions, gossip, regrets, kindnesses, and opinions" (p. 20). His observations range from offices and seminars to even free time activities (including a family summer cottage). The educational contents include exercises that form a practical toolkit in deep time thinking. The sheer amount of material is and would be impressive for any academic or popular science work.

The book's introduction focuses on the key actors: the Finnish nuclear waste management company Posiva and the radiation and nuclear safety authority STUK. Between them is the Safety Case, a repository safety assessment report that is a precondition for the government-approved construction license for Onkalo. The Safety Case becomes a main topic for the ethnographic analysis, offering a window into the far-future Finland that is produced in the myriad of technical reports that constitute it.

The first empirical chapter examines a key element of the Safety Case: analogy studies, where analogies of various sorts from Finnish prehistory to modern-day glaciers in Greenland are drawn upon to anticipate future Finland. The second chapter moves into computer modelling



and explains how multiple computer simulations are integrated to a framework to foresee far-future geological and ecological conditions. Embracing several kinds of uncertainties, these models also have fixed properties – lifestyles and human needs are assumed to stay unaltered far into the future that comments on the anthropological assumptions of these models.

The third chapter examines the topics of “zooming in” and “zooming out”: how the Safety Case professionals have to be constantly zooming back and forth between near and far human, ecological, and geological histories in their work. The fourth chapter opens up how the Safety Case changed when its key developer passed away unexpectedly and how his legacy continued to shape the working practices on an everyday basis.

The Conclusion recommends how to embrace deep time based on the findings and the lessons learned. It is followed by a lexicon of key technical and academic terms and notes.

Mixing popularizing and academic arguments, the book contributes to knowledge from various perspectives. As science journalism, the book is an impressive achievement. It explains complex issues of nuclear technology and studies it in an accessible way through the lives of people involved. This presentation teaches much: including the history of Finland, its particular kind of energy sector, the expertise involved in risk management, and nuclear waste issues everywhere. The deep time reckoning lexicon is particularly impressive and has potential to be published on its own.

But Ialenti’s findings also align with many main thematic areas in STS and anthropological scholarship, and strengthen them. One is on interdisciplinarity: nuclear waste management constitutes highly interdisciplinary expertise, integrating disciplines and professionals from geologists to biologists, engineers, and metallurgists. Indeed, the far-future anticipation requires a huge amount of teamwork, with the Safety Case experts “working in complex collaborations that, as a whole, exceed any single person’s comprehension, yet still somehow work” (p. 19). To examine this knowledge in the making, Ialenti makes a great methodological addition to STS scholarship in “following the actors” holistically as humans. He does not stop his fieldwork in offices

and computer modelling, even if these are also of paramount importance for the analysis.

In doing this, however, the work could have taken a few steps further into current expertise scholarship. The deflation of expertise is a powerful critique and Ialenti develops it especially drawing from the United States, where such issues were prominent in the past years and have remained pertinent. The idea produces further insights all over the world, such as in research: like Ialenti’s informants, the success of researchers is increasingly measured by meeting productivity goals, rather than their expertise per se (pp. 34-35). This is another example of deflating the expertise of the professional studied.

But some STS scholars could still conceptualize experts and expertise in a slightly different manner. Ialenti seems to liken expertise to authorized knowledge and its production. This is a valid definition but may pay less attention to recent STS themes: such as counter-expertise, the multifocality of expertise, and its dispersed and relational nature (Åkerman et al. 2020). While the book is nuanced within the nuclear sector and its own knowledge disputes, it indicates this gap when it comes to describing publics and their knowledge about experts.

In several points, Finns are claimed to show relatively strong trust or even admiration of expertise, engineers, and natural scientists. In others, this argument is inverted: Finns also oppose expertise e.g. in antinuclear demonstrations or during economic crises that experts could not foresee. But this conclusion feels too binary: either Finns trust in the experts or oppose them, “the embrace (in experts) had both promises and perils” (p.30). This binary probably sidesteps a more complex situation: such as the polarized mix of trust and distrust, moral responsibilities, and perceived risk and benefits that local publics in Finland have associated with Onkalo (Litmanen et al., 2010). In terms of experts, multifocal expertise and different epistemic claims are involved in these arguments that do not quite conform to the accept/reject dichotomy.

At one point, Ialenti observes that “most Finns I met saw the Olkiluoto repository as a pragmatic solution to an unfortunate problem” (p. 35). This contains further ground than dichotomies and opens an important issue: how different publics

are capable of solving such pragmatic problems in the far future and with what consequences. Studying these public issues could provide an

opportunity to continue this work in STS both academically and as concerns interacting with the public.

## References

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