

Dimitris Papadopoulos, María Puig de la Bellacasa and Natasha Myers (eds), *Reactivating Elements: Chemistry, Ecology, Practice*, Durham: Duke University Press, 2021. ISBN: 978-1-4780-1436-2 (paper); ISBN: 978-1-4780-1344-0 (cloth)

Reviewing edited collections can be a daunting task and this one proved especially so. Originating as a series of talks at the 2016 annual meeting of the Society for Social Studies of Science (4S), *Reactivating Elements: Chemistry, Ecology, Practice* seeks to reactivate elemental thinking through a multitude of new “provocations and curiosities”. While readers may be inclined to approach this as a book about novel approaches to rethinking the agency of chemicals in the Anthropocene, the book is not that. By pushing elemental thinking beyond the chemical elements themselves, the editors ask us to consider all the ways in which elemental thinking can contribute to new ways of understanding how humans and non-humans are “shaping Earth’s possible futures”. The editors “capaciously” expand elemental thinking to include elements as first principles; elements as relational substances; elements as metaphors for life and scientific practice; elements as organisations of matter and energy; elements as ghostly remnants and ubiquitous substances; elements as earth, air, fire, and water; and elements as the irreducible. This expansive approach to elemental thinking made the collection scholarly rich but it is also what made it difficult to wrap my head around at times.

Reactivating Elements is composed of 11 chapters along with an introduction from the editors, two of whom (Papadopoulos and Puig de la Bellacasa) also have individual chapters. For the 4S conference the editors invited well-established scholars in their fields to explore elemental thinking in the “spirit of speculative inventiveness” without an “overarching theory or model of thought”. This is not only reflected in the extensive conceptions of elemental thinking but also in the text itself, as some chapters resemble more traditional articles while others offer readers more unconventional forms of academic writing. Nevertheless, the chapters are all collectively grounded in a dedication to “critical and feminist science and technology studies”.

As someone with a deep interest in the chemical nature of the world, I first turned to those chapters. Isabelle Stengers immediately sparked my curiosity by interrogating the basic question of what a chemical element *is* as well as by asking what our obligations are to chemicals, chemistry, and the decolonisation of matter. I was sympathetic to Papadopoulos' push to envision just "alternative ecological chemospheres" and new ways of practising chemistry. Joseph Masco challenged me to think about what the world is actually made of by exploring what it means for a synthetic chemical to be ubiquitous, while Michelle Murphy prompted me to reimagine chemicals with and against technoscience.

But perhaps my favorite chapter in this vein was Joseph Dumit's use of the halogen bromine to explore the role of surprise in challenging scientific orthodoxy. In one section Dumit follows extracellular matrix (ECM) researchers in their quest to understand bromine's role in catalysing fascial tissue formation. New instrumental analysis of ECM had surprised scientists because it nullified the models and categories they were using to understand it. The issue was that their "metaphoric assumptions" only let them envision fascia as *one thing* when it is actually always *many things*. In exploring the ideologies of bromine chemistry, Dumit argues that a "substance as method" approach could help explore the "in-betweenness" of scientific categories and help better understand how our relations to nature are contingent upon the instruments and vocabularies used to reveal them. What I really liked about this approach is that it shows that chemical elements and molecules should not be examined outside their life histories and the chemical ideologies that inform those stories.

My biggest surprise about the collection, however, came from chapters that approached the call from the broad perspective of the four classical elements. Puig de la Bellacasa, for instance, uses biogeochemical breakdown and elemental recirculation within the earth to challenge life's origin story as the culmination of "achieved complexity". Puig de la Bellacasa also seeks a "breakdown ecopoethics" (ecological thinking, ethics, and making/creating) in order to imagine the politics and ambivalences of possible bioremediated futures. Patrick Bresnihan

stunned me with a simple question: “What does it mean to put the word *energy* after wind?” Thinking through the infrastructures of colonisation and wind power, he tells a fascinating story of making wind into a commodity (again), detailing the infrastructures needed to primitively accumulate something so elusive and un-enclosable.

But the chapter that really caught my eye was Tim Choy’s on breath and externalities. Like Choy, I too have problems with the concept of externality, a cost not accounted for within the price of a good. For me, it makes grand assumptions about how the world should work rather than how it actually does. Choy’s concern, however, is that those unaccounted-for costs are ultimately paid by those that breathe. Choy uses this non-universal “breather” and a “Museum of Breathers” to reflectively speculate on externality as a form “atmospheric reckoning”. The chapter was otherworldly in many ways, but especially because of the analytic of conspiracy—“the commitment to breathe together”—that while proffered as a form of collective solidarity and alternative future-making takes on a vastly different overtone in a Covid-19 world and its new conspiracies of breath.

Despite the collection’s expansive approach, there was one aspect of elementary thinking that I found wanting. While practice was a key part of the editors’ and authors’ interventions, the first principle of labour was not. I understand that it was not a focus of the edited collection and that labour and concern for workers does show up indirectly in many different places. But as someone with a background in political economy I have a hard time not thinking about the elemental primacy of labour. Any future alternative chemosphere certainly requires new ways of relating to the non-human world, yet it will still be human labour that makes that world possible. It will still be those at the front lines of elemental extraction, processing, use, and disposal that will really come to know elements.

I want to end with an anecdote from a business conference I attended as a provocation of my own. At that conference the CEO of major fertiliser company was asked an accusatory question by an audience member about whether sustainable thinking or new technology could

fundamentally remake a plant's elemental relations. Despite it being many years ago I remember it clearly because of the disdain that dribbled from the CEO's mouth as he responded. You may change how much a plant needs or where it gets its phosphorus from, he said, but new ways of thinking or new technologies will not change the fact that a plant needs phosphorus to grow.

Adam M. Romero
Science, Technology, and Society
University of Washington Bothell
adrom@uw.edu

March 2022