Acid test on limestone, C. Simonetti, 2017

LIMESTONE
Cristián Simonetti

This small piece of limestone comes from Ñilhue, a mine owned by Melón, the first company in Chile to mine the material industrially, for the production of cement. Melón's operations started nearly a century ago in Calera, a town not far from Valparaíso. Calera is famous for its name, which comes from lime ('cal' in Spanish), a chemical made by burning limestone at about 1,000°C. As in the production of lime, the stone releases carbon dioxide (CO_2) bubbles in reaction to drops of hydrochloric acid, added by the man in charge of mining operations at Ñilhue. This *acid test*, as it is known among geologists, corroborates the presence of calcium carbonate ($CaCO_3$), a mix of calcium oxide (CaO) – otherwise known as lime – and CO_2 that is the main component in limestone. Soon the stone will be burned at even higher temperatures (about 1,500°C), along with small quantities of sand and clay, to produce cement. The melting will take place inside Melón's kilns at Calera. Powered by coal and natural gas, flames in this type of kiln reach about 1,900°C, one-third of the sun's surface temperature. At such temperatures, all of the CO_2 contained in the stone will be released into the atmosphere, contributing to global warming. Globally, cement production is responsible for between 5 and 10 percent of all carbon emissions. Like the bubbles in the above picture, the CO_2 coming out of Melon's furnaces is both transparent and odourless. It remains unnoticed in a sensory climate where seeing is believing and strong smells are associated with precariousness.

Through the transformations of this small limestone I wish to briefly narrate some of earth's history, following the lead of generations of geologists who have perfected the skill of seeing the long in the now by paying attention to stones. This practice is often dated back to the publication of *Theory of the Earth* by James Hutton (1795), who is credited for making the abyss of time, solidified in the masses of the Scottish landscape, flow once again. Hutton was among the first to point out how things were constantly in the making. 'No vestige of a beginning, no prospect of an end' was his famous claim. Jan Zalasiewicz offers a recent contemporary example of this skill. As one of the leaders behind the controversial effort to formalize the definition of our current geological epoch – termed the Anthropocene, to signal humans as a leading geological force at the planetary scale – Zalasiewicz (2010) narrates the earth's history starting from a pebble. Unlike Zalasiewicz, my narrative is not through an ordinary pebble found on a beach, but from an industrially mined stone made of calcium oxide and CO_2. Imagine how many planets could be envisioned depending on which stone you pick.

Limestone makes up around 10 percent of all sedimentary rocks and is mined almost everywhere in the world. It has varied

industrial applications, including most notably the production of steel and cement, perhaps the most indispensable materials in the building of modernity. According to the *National Lime Association*, comprised of U.S. and Canadian commercial lime companies, we're talking about 'the versatile mineral, the building block of construction and human progress that is a fundamental part of your everyday life, whether you realize it or not'.[1] Before cement was rediscovered in the eighteenth century, limestone and lime had been used, respectively, as building stone and mortar in construction for over 8,000 years. A versatile material, lime is used in products with countless applications, appearing in many of the things that we now use daily, including industrial materials such as plastic, paper, ink, paint, glass, and rubber, as well as some foods.

However, our relationship to this piece of limestone extends even further back in time. Caught in an endless exchange of matter and energy, our stories entangle to the very start of life as we know it. Limestone is made of the same stuff that composes our bones. Just like our ancestors, this small limestone came out of the ocean, moved by tectonic forces. It is made of the fossilized skeletons of sea organisms. A process that is still underway, the geological formation of limestone dates back 542 million years to a sudden increase in the concentration of calcium in the earth's oceans, possibly triggered by a combination of erosion and volcanic activity. This calcium concentration resulted in a process of *mineralization* (skeletonization) in organisms from the so-called Cambrian explosion, where essentially all mayor animal phyla appeared in the fossil record and which subsequently led to the appearance of our vertebrate ancestors, who slowly crawled out of the oceans. In the words of Rachel Carlson, 'our lime-hardened skeletons are a heritage from the calcium-rich ocean of Cambrian time' (1950: 13–14). Like sea organisms, we humans are also somewhat lime-creatures.

1 http://lime.org/lime-basics/why-is-lime-still-important/ (13 February 2017).

According to DeLanda's (1997) *A Thousand Years of Non-Linear History*, this mineralization has been turned outside in and inside out a number of times during evolution. By burning the exoskeletons of sea critters at high temperatures to produce lime and cement, humans have created their own exoskeletons, to further protect the soft tissue which their endoskeletons support. In doing so, humans have accelerated deep time, fuelled by Promethean illusions. In their furnaces, they have released in an instant carbon accumulated over millennia, turning sedimentary formations into igneous flows. However, these are not the volcanic flows which DeLanda contrasts against sedimentary formations, in dialogue with Deleuze and Guattari's (1987) famous distinction between *rhizomatic* and *arboreal* models of evolution. Unlike the hierarchical view of evolution presented in Darwin's tree of life, which is modelled on a vertically stratified fossil record contained inside sedimentary rocks, rhizomatic forms and volcanic flows would flatten relations, challenging human exceptionalism.

In a totally contrasting mode, modern construction has turned limestone, a sedimentary rock, into an igneous cement, only to turn it back into the ultimate sedimentary layer on top of which the history of modernity is to be written. Concrete's impermeable surfaces – made of cement, sand and aggregate – have lifted humans above the land while suffocating nature. However, these are only provisory illusions in that no concrete surface is impervious to decay, each one depending on extended practices of care. Given enough time, all solid matter is meant to flow (Harkness et al. 2015).

Curiously, the Anthropocene – a word that most scholars in the humanities seem to simultaneously love and hate – resembles how Westerners have played God in their attempts to subdue nature below concrete surfaces. For geoscientists in charge of its formalization, the term stands for yet another layer in earth's history, placed atop all others in geological charts. This punctuated understanding of chronology is

revealed in how most efforts to formalize the Anthropocene have focused on identifying its date of birth (Simonetti 2017). Such an understanding of chronology risks sending into oblivion the much deeper history of the mingling of humans and the inhuman. No doubt we need a fair starting date for the Anthropocene, if we are at all to achieve some sense of environmental responsibility. However, this date should not be baptismal in nature, which would resemble how modernity wishes to place itself above tradition, once and for all.

Besides, how much more do we risk in reducing the present to the entanglements produced by one particular species? How many other entanglements beyond the human will be erased if we dare to place ourselves at the centre of the present? What would it be like to write from the viewpoint of shells, instead of humans? Would they consider us relatives, after we have destroyed all remaining coral reefs that still contain/trap CO_2? Ultimately, compressing deep time into a pebble and accelerating deep time in a kiln result from similar infatuations with human ingenuity. Both modern industries and science have been justified based on triumphalist narratives of progress.

Give way to the impermanence of surfaces on which modern values stand; challenge the fascination with narrating origin myths and stabilizing periodizations; leave the retrospective emphasis on a single *deep past*, opening up forward-looking speculations on how *deep futures* multiply. Hopefully, cracks will open, allowing for entanglements beyond the human to mushroom.[2]

References

Carlson, R. 1950. *The Sea Around Us*. Oxford: Oxford UP.

DeLanda, M. 1997. *A Thousand Years of Non-Linear History*. Zone Books.

Deleuze, G. and Guattari, F. 1987. *A Thousand Plateaus*, trans. B. Massumi. London: Continuum.

Harkness, R., Simonetti, C. and Winter, J. 2015. 'Liquid Rock: Gathering, Flattening, Curing'. *Parallax* 76, 309–326.

Hutton, J. 1795. *Theory of the Earth with Proofs and Illustrations, vol. I & II*. Edinburgh: William Creech.

Simonetti, C. 2017. *Sentient Conceptualisations. Time in Archaeology*. London: Routledge.

Zalasiewicz, J. 2010. *The Planet in a Pebble: A Journey into Earth's Deep History*. Oxford: Oxford University Press.

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Patterned tree roots, W.F. Xue, 2011