Subterranean (In)visibilities: Traces, Underground Water, and Thermal Flows in the El Tatio Geyser Field, Atacama, Chile

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Summary

This article explores stories of underground water in the "El Tatio" geyser field, focusing on traces from geothermal energy explorations, namely a well. Rather than express a distant past in the landscape, these traces have had an active role in the energy futures of the place. Specifically, in the year 2009, an environmental conflict was produced by geothermal exploration and the explosion of a steam column. In this piece, I want to follow the trajectories of underground water through these infrastructures. Crossing different regimes of (in)visibility, traces have the power to activate diverse trajectories, interrupting and destabilizing geothermal futures.



Fig. 1. Geyser eruption, El Tatio, 2019.

Photograph by Martín Fonck, 2019.

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In the Atacama Desert in northern Chile—high in the Andes—the largest geyser field in the southern hemisphere, the El Tatio geyser field, is located. In this valley, the geysers' activity produces an atmosphere of steam and sulfur, expressing the irruption of underground phenomena on the surface. In 2009, the company Geotérmica del Norte S.A.—supported by the Italian company ENEL—explored El Tatio's underground water reservoirs to evaluate the possibilities for, and ultimately produce, electric energy. Their initial plan was to drill

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deep geothermal wells, planning four wells between 2,000 and 2,500 meters deep (SEIA, 2007). Nevertheless, during the exploration, a column of steam exploded from inside the Earth, with its discharge lasting for 27 days and reaching as high as 60 meters (Vargas, 2018).

Loud subterranean noises followed the eruption. In response to this event, local organizations and Atacameño communities created the committee "La Defensa del Tatio," protesting against geothermal exploration and ultimately causing the project to be shut down (Bolados García, 2014). This event received extensive media coverage (Otero, 2015), making visible conflicts related to underground water explorations in this area. El Tatio is located in Atacameño territories, where water is sacred. In the Andean context, mountains are considered a source of water, life, and the protection of ancestors (Carrasco, 2020).



Fig. 2. A column of steam produced by a geothermal well blowout.

Photograph by Gerard Prins, 2009.
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Fig. 3. Geyser steam and traces of geothermal exploration.

Photograph by J. Alan Glennon, n.d.
Courtesy of GeyserTimes

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However, less attention has been paid, from the humanities and social-science perspective, to the role of *traces* in this story. By traces, I understand the remains of past actions: "objects, leftovers, marks left by something that passed, architectural ruins, and defunct apparatus ... Traces may be overlooked or discovered, intimately relished and forgotten, turned into tokens of sociality, or made banners of conflict. Traces are surprising, unexpected, rarely intentional, and sometimes scandalous" (Geissler et al., 2016: 15–16). Rather than only highlighting the absence of past actions, traces can also affect and produce unexpected futures, as this case shows. The official incident records (SEIA, 2009) indicate that the company reused a well that was constructed during previous explorations in 1973, and that the material conditions of this old well caused the explosion in 2009. During the reactivation of abandoned infrastructure, the steam temperature and pressure caused the well to collapse.

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In this story, the role of traces, in the form of past human technological interventions and their environmental consequences, allows us to pay close attention to the politics and aesthetics of (in)visible and ignored subterranean dynamics, such as thermal flows. This piece focuses on the potential of traces and subterranean ecologies to interrupt and destabilize human technological interventions.



Fig. 4. Traces of geothermal energy projects in El Tatio.

Photograph by LBM1948, 2008.
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Following traces in historical reports of geothermal explorations, human interventions below this place are not new. From the beginning of the twentieth century, engineers and geologists have been exploring and imagining geothermal energy futures in El Tatio. In 1923, Italian engineers described the first measurements they had made in this specific area of South America (Tocchi, 1923). Later, between 1968 and 1976, these explorations were continued by the Chilean Economic Development Agency (CORFO) and United Nations Development Programme (UNDP), who drilled exploratory wells to analyze the area's geothermal potential (Lahsen and Trujillo, 1975). However, these projects and their promise were abandoned as well, leaving material traces on this place's surface that are still visible today, as figures 3, 4, and 5 show.

Visiting this place nowadays, overwhelmed by this scenario's visual impact, catching a glimpse of the field, it is also possible to recognize traces of abandoned machinery from geothermal energy explorations.

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Fig. 5. A geyser cone and a geothermal well.

Photograph by Martín Fonck, 2019.

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Figure 5 shows a geothermal well. This trace was made by machines penetrating and drilling under the ground and a pipe descending. However, it does not just suggest a vertical descending movement. In the image, two gestures are present. The shape of the geyser shows an upward action, opposite to that of the well. The boiling water of the geyser rises from under the ground. These small sinter mounds created by the geysers' eruptions are geological traces you can observe on the surface. Getting closer to the hole, you can hear the sound of the underground water boiling and coming to the surface.

In the depths of El Tatio's underground, these abandoned traces are scattered. During the explorations mentioned in this piece, rocks and water flows were penetrated to install the wells. The abandoned exploration technologies are in constant contact with underground water. Infrastructures of exploration have had to coexist with thermal flows, experiencing a process of decay and material transformation.

In my current project about subterranean exploration and geothermal (in)visibilities in the Andes, I am studying

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these traces and the stories in which they are embedded. Interestingly, as the explosion at El Tatio shows, underground water's physical characteristics constitute an unstable element. Water is fugitive, moving and changing its shape. The heat from the interior continuously transforms the physical state of the water and the materiality of underground wells. The activation of invisible subterranean water as a geothermal resource paradoxically became evidence of its uncontrolled presence.

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Further readings:

- Bolados García, Paola. "Los conflictos etnoambientales de 'Pampa colorada' y 'El tatio' en el Salar de Atacama, Norte de Chile: Procesos étnicos en un contexto minero y turístico transnacional." *Estudios atacameños* 48 (2014): 228–48. doi:10.4067/S0718-10432014000200015
- Carrasco, Anita. *Embracing the Anaconda: A Chronicle of Atacameño Life and Mining in the Andes*. Lanham: Lexington Books, 2020.
- Geissler, Paul W., Guillaume Lachenal, John Manton, and Noémi Tousignant, eds. *Traces of the Future: An Archaeology of Medical Science in Africa*. Bristol: Intellect Ltd., 2016.
- Lahsen, A., and P. Trujillo. *El Tatio Geothermal Field, Chile*. 2nd UN Symposium on Development and Use of Geothermal Resources, San Francisco, CA, I (1975): 157–178.
- Otero, Sofía. "Fighting the Information Gap and the Steam Monster, the Chilean Experience on Geothermal Outreach." *Proceedings of the World Geothermal Congress*, 2015, 1–6.
- Servicio de Evaluación de Impacto Ambiental. *Informe de contingencia ocurrida en pozo CORFO N°10, sector Geiser del Tatio*. Informe contingencia, pronunciamieno servicios, respuestas titular. 2009.
- Vargas, Sofía. "Understanding Social Acceptance of Geothermal Energy: Case Study for Araucanía Region, Chile." *Geothermics* 72 (2018): 138–44.

Related links:

- Servicio de Evaluación de Impacto Ambiental. *Ficha del Proyecto: Perforación Geotérmica Profunda El Tatio Fase I*. 2007.
  https://seia.sea.gob.cl/seia-web/ficha/fichaPrincipal.php
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Martín Fonck is a research associate at the Institute for Advanced Sustainability Studies, Potsdam. He completed his PhD at the Rachel Carson Center for Environment and Society and the Institute of Social and Cultural Anthropology at the Ludwig-Maximilian University, Munich. Martín’s main interest lies in studying narratives and imaginaries of environmental politics in the transition towards sustainability. Currently, he is writing about technologies of exploration based on his doctoral project on geothermal energy futures in the Chilean Andes, with a specific interest in cultures and aesthetics of evidence. Within the research group “Planetary Geopolitics and Geoengineering,” Martín reflects on how ecological processes are transformed into unexpected technologies to face the planetary crisis. He is interested in analyzing the potentials and unforeseen consequences of these processes from an ethnographic and historical perspective.
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