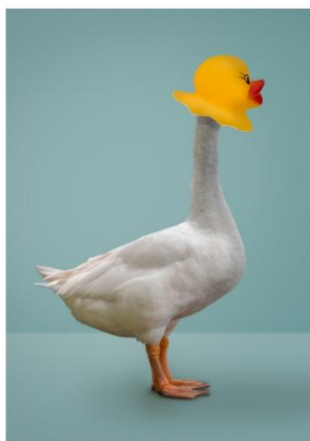
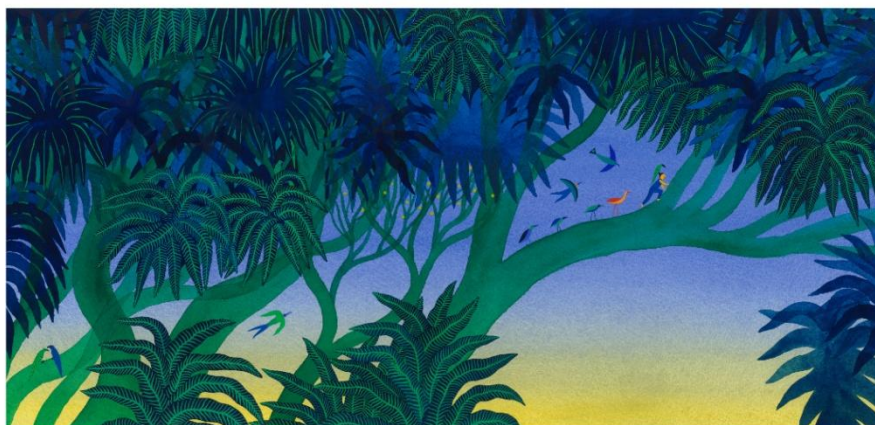

SPRINGS

THE RACHEL CARSON CENTER REVIEW

Issue #4 | 2023

October



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The Rachel Carson Center
Review

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Note from the Editors

The RCC is delighted to bring you the fourth issue of [Springs: The Rachel Carson Center Review](#), our open-access online publication surveying the interrelationship between social and environmental changes.

In this edition, our authors' research and insights lead us across four continents, from the streets of downtown Los Angeles to the heart of the Ecuadorian Amazon, into the woodlands of southwest Nigeria, and along Ukraine's Dnipro river.

Historian Frank Zelko's "[In the Teeth of History](#)" yanks the root causes of tooth loss in industrial societies from the long history of dental ecology. By examining the evolution of starch and refined sugar consumption as well as the impacts of the fertilizer industry and the introduction of water fluoridation practices, he outlines the ways in which industrial societies have attempted to address their compounding, societal caries.

When legal scholar Jens Kersten speaks in "[Ecological Constitutionalism](#)," it is to emphatically implore the liberal and democratic states of the Global North to transform their social and constitutional orders and embrace their collective responsibility for the sustained and future health of the planet.

With "[Adventures in Mockstitutions](#)," writer and artist Jenny Price pulls us through the looking glass into the unique world of alt and mockstitution projects that work to mimic and distort the practices of established organizations. While we're there, she encourages us to reimagine our understanding of major institutions' environmental impacts.

Then, in "[Not Every Kid Is WEIRD](#)," one of our editors, Brady Fauth, sits down with anthropologist and principal investigator of the new Volkswagen Freigeist Grant project, LearningNatures, Francesca Mezzenzana, to discuss her developing research into children's human-nonhuman relationships across cultures.

The Dnipro river, a major focus of Soviet industrialization and collectivization efforts over the last one hundred years, is the subject of historian Paul Josephson's "[Rivers as Battlefields](#)." As he explores the complex history of reservoir and dam projects along the Dnipro in Ukraine, he emphasizes the human suffering and environmental devastation that has resulted from the destruction of the Kakhovka Dam in 2023.

Professor of environment and sustainability Irus Braverman holds under the microscope the ongoing convergences among technological innovation, nature conservation, and the Israeli military by centering on a griffon vulture breeding project in "[Mother Drone, Mother Nature](#)."

And finally, in "[Home, Roots, Cosmos](#)," literary scholar Serenella Iovino writes about Italo Calvino's personal history in the Ligurian town of Sanremo and its influence on his 1957 novel, *The Baron in the Trees*, uncovering the author's unique political ecology and asking us not just to consider the literary works we read as existing alongside their landscapes, but within them.

Architect Joseph Adedeji encourages us to experience the power of built heritage as a cultural agent and a symbol of hope for a harmonious coexistence of society and the nonhuman world in his photo essay "[Yoruba Architectural Sites in Nigeria](#)."

As we digest the marvelous images of cultural anthropologist Amelia Fiske and illustrator Jonas Fischer's "[Crude Encounters](#)," we are asked to consider the ecological and psychological impacts of oil extraction on the Ecuadorian Amazon.

Springs also continues to bring together writing from other RCC publications. Its [archive](#) curates articles that were published in the open-access online and print journal [RCC Perspectives](#) (2010-20), in the blog [Seeing the Woods](#) (2012-21), and in the peer-reviewed online journal [Arcadia: Explorations in Environmental History](#).

Munich,
31 October 2023

IN THE TEETH OF HISTORY: DENTAL DECAY IN THE *LONGUE DUREE*

Frank Zelko

Springs
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4 • 2023



This article is peer reviewed

Frank Zelko

In recent years, I have been writing a book on the history of water fluoridation, a practice that is dental dogma in a handful of countries, particularly in the English-speaking world. Unsurprisingly, historical inquiry reveals that the story is more complex than the triumphalist public-health narrative that justifies the practice. Like all historians, I have had to determine the temporal boundaries of the study and have chosen to concentrate on the twentieth century. In this framing, the focus is on three intertwining stories: the rampant tooth decay that afflicted a large proportion of the population of wealthy nations by the Second World War; the dramatic increase in fluoride pollution from industries such as aluminum- and phosphate-fertilizer production; and dentistry's urgent search for a signature initiative to raise its standing within the medical and scientific communities.



Miniature on an initial "D" with a scene representing teeth (*dentes*). A dentist with silver forceps and a necklace of large teeth, extracting the tooth of a seated man. Originally published in James le Palmer, *Omne Bonum* (London, 1360-75). [Wikimedia Commons](#). [Public domain](#). This image has been cropped.

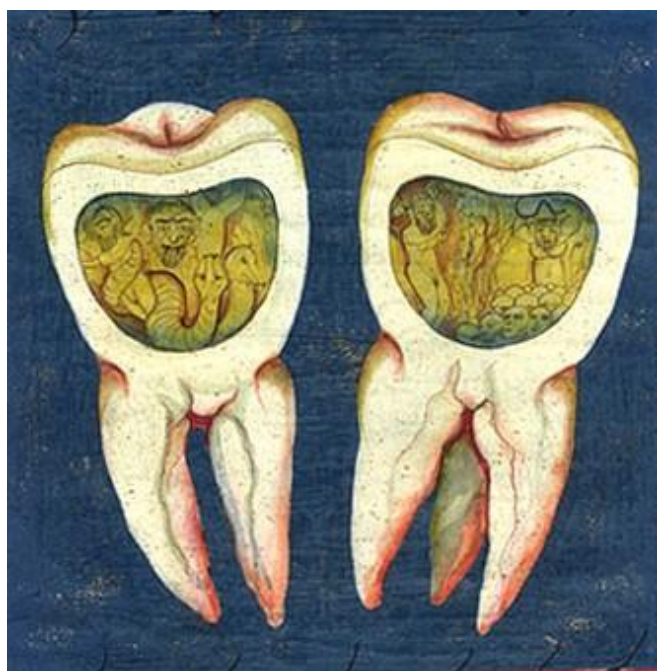
Every now and then, however, I view the subject through a wider aperture. When did tooth decay become a significant problem, and why? How did humans become so vulnerable to dental deterioration, and why have we gravitated toward foods that are most likely to cause it? Learning about the long history of dental maladies involves detours into physical anthropology, while understanding their etiology requires a dive into microbiology. The overall impression is that the mouth is its own ecosystem, or microbiome, subject to the same kind of perturbations that ecologists find in ponds or forests.¹

Unavoidably, as with the pond or the forest, there is a degree of arbitrariness in abstracting the oral ecosystem from the broader environment in which it is situated. The pond is part of a complex interconnected system that includes the farm and the feedlot. Similarly, the mouth, as well as being connected to the rest of the body, is subject to inputs and outputs that are frequently determined by economic circumstances and cultural preferences. Nonetheless, the ecosystem view offers a useful framing, one in which teeth are subject to long-term biocultural forces. In the process, it elucidates

the historical contingency and constructedness of various dental ideas, conditions, and practices people take for granted.²

Just as a mountain range hosts different species in its various biomes and at varying altitudes, dental bacteria specialize in colonizing particular surfaces of the teeth.

The average mouth contains at any given time somewhere between seven hundred and one thousand species of microbes. Their swampy home is bathed in saliva and continuously heated to around 36°C, the odd gulp of scalding coffee or ice-cold lager notwithstanding. Saliva's manifold properties include its ability to help remineralize enamel as well as regulating the fluctuating microbial population that dwells in our oral cavity. Somewhat counterintuitively, the most salubrious microbial home in this ecosystem is the teeth. Whereas the mouth's mucosal surfaces are constantly peeling and flaking, thereby reducing their bacterial load, teeth do not desquamate. Hence, they provide a relatively stable surface to which a surprising variety of bacteria can adhere. Just as a mountain range hosts different species in its various biomes and at varying altitudes, dental bacteria specialize in colonizing particular surfaces of the teeth: some enjoy living in close proximity to the gumline, while others prefer the network of nooks and crannies on top of the molars. In conjunction with food and saliva, these microbes form a biofilm—known as dental plaque—that coats the teeth.³



A modern painting over an eighteenth-century Ottoman manuscript, depicting Jinn causing toothaches. Artist unknown. [Wikimedia Commons](#). [Public domain](#). This image has been cropped.

In the good old days before the Neolithic, the microbes that inhabited plaque formed a happily balanced ecosystem, feeding on the microscopic residue of proteins, fats, and carbohydrates that evaded swallowing. While the population of different bacteria no doubt waxed and waned according to seasonal dietary variation, none ever came to dominate the rest. When one threatened to do so, like France in nineteenth-century Europe, the others quickly convened a Congress of Vienna to put it back in its place. About 10 thousand years ago, however, some members of our species rather abruptly began to increase the proportion of carbohydrates in their diet. Instead of supplementing a predominantly animal-based menu—everything from mammoths to mollusks—with some tubers and berries, these impoverished diners began to subsist largely on a few species of grass seeds. Over time, they continued to refine these foods, making them more palatable. For the carbohydrate-loving bacteria inhabiting teeth, every day was now Thanksgiving.

In the oral ecosystem, fermentable carbohydrates are like fertilizer runoff in a pond. In the latter, the sudden infusion of phosphorous causes algal blooms, which then decompose and deplete the water of oxygen, a process called eutrophication. In the mouth, fermentable carbohydrates catabolize to acids, such as lactic acid, thereby increasing the acidity of the plaque biofilm. This favors the growth of a few acid-tolerant species, such as streptococcus and lactobacillus. As they come to dominate their environment, they acidify the liquid in plaque biofilm, which then demineralizes enamel and dentin, allowing bacteria to enter the pulp and infect the tooth. The term that describes both the process of demineralization and the lesions that frequently result is dental

caries. Adjectives that describe the pain of advanced tooth infection include excruciating, agonizing, and torturous.⁴

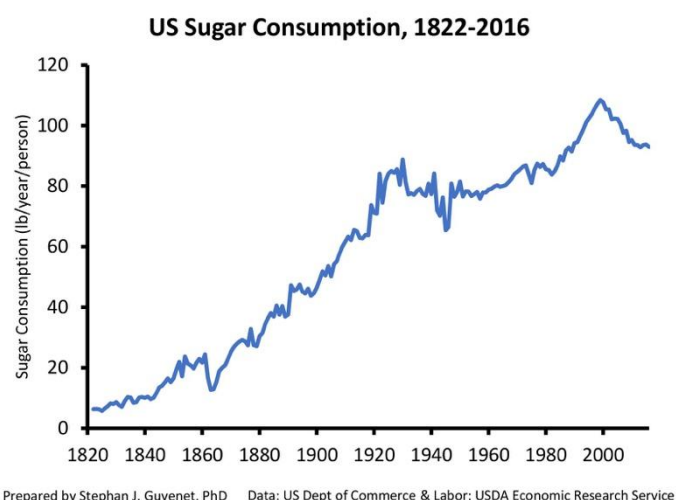
Judging by evidence from skeletal remains, dental caries, although not entirely absent, was uncommon prior to the emergence of agrarian societies. When it is found in Paleolithic sites, it is generally thought to indicate that the population was beginning to make the dietary shifts characteristic of agriculturalists.⁵ From the Neolithic onward, the majority of skulls tend to contain teeth with at least one carious lesion. A recent study of an early farming community in Germany, for example, found that 68 percent of adults displayed the telltale wear and tear of caries. This fits with the broader anthropological pattern in which human teeth exhibit higher rates of caries over time.⁶

The kind of food that could feed lots of people, it turned out, upset the balance of our oral ecosystem. Regular and widespread toothache was part of the tradeoff in our species' long-term, cereal-fueled population growth. Complex carbohydrates like wheat and rice, however, were relatively benign compared to the caries bomb that exploded in mouths across much of the world with the onset of European imperialism and the Industrial Revolution. If bread was like coal for cariogenic bacteria, refined sugar was rocket fuel. The craving for sweetness evolved in an environment of sugar scarcity, encouraging the consumption of energy-rich foods on the rare occasions they were available; it could not be turned off with the flick of a switch. Exploration, expropriation, and slavery made sugar increasingly abundant and affordable. Unsurprisingly, consumption soared, as did toothache, extraction, and widespread dental malaise of the kind the species had never before experienced.⁷

Complex carbohydrates like wheat were relatively benign compared to the caries bomb that exploded in mouths across much of the world with the onset of European imperialism and the Industrial Revolution.

According to Daniel Lieberman, an evolutionary biologist at Harvard who has examined thousands of ancient skulls from all over the world, “[m]ost skulls from the last few hundred years are a dentist’s nightmare,” with cavities and abscesses increasingly numerous as one approaches the modern era.⁸ There is nothing to suggest this change is genetically driven. Rather, the history of dental caries involves an interplay of culture and biology in which changing dietary patterns altered our microbial makeup. Essentially, we exchanged healthy teeth for cheap and easily metabolized energy.⁹

While sugar is not the only cause of the modern caries epidemic, it is clearly the major one. Throughout the nineteenth century, the British were the world’s greatest sugar consumers and consequently endured the most dental distress. In the twentieth century, the United States took the lead; by 1926, US citizens and nationals were swallowing 50 kilograms of refined sugar per capita annually, a number that has held relatively steady ever since.¹⁰ In the mid-1930s, a survey by the United States Public Health Service determined that 71 percent of 12- to 14-year-olds had one or more carious teeth. This was alarming for a number of reasons. Caries was not merely a problem of childhood: it had multiple ramifications for both oral and overall health, including



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secondary infections in the heart and brain. Among the most important consequences from the perspective of the federal government was that an unacceptably high number of young men were failing military-recruitment physicals because they lacked enough sound teeth to adequately chew their rations.¹¹

For early twentieth-century dentists and health officials, the solution to the caries epidemic seemed clear: stop eating so much refined sugar and starch. Then as now, the idea of achieving this seemed so remote as to be laughable. An alternative was to look to minerals and micronutrients that could fortify enamel or create an oral environment less conducive to cariogenic bacteria. After many years of research, a group of dentists and industrial chemists came to the conclusion that fluoride could play a significant role in caries control.¹²

In its pure form, elemental fluorine is a highly toxic pale yellow gas that reacts violently with almost all organic material. It cuts through steel and glass and burns through asbestos. It is the least stable element in the periodic table, a volatile atomic particle in constant tension with its surrounding elements, ravenously devouring their electrons to alleviate its core pressure. Fortunately, fluorine rarely exists in its pure form: nature keeps it in check by binding it with other elements, forming various compounds known as fluorides.¹³ In the global biogeochemical cycle, the vast majority of fluoride on the earth's surface is spewed out by volcanoes, predominantly as hydrogen-fluoride gas. It bonds with other elements to form compounds such as calcium fluoride, sodium fluoride, and many others that are deposited in soil, rocks, and the ocean, and unevenly distributed around the planet. Since the eighteenth century, coal burning and various industrial processes such as phosphate-fertilizer production have added significant quantities of fluoride to the biogeochemical cycle. Over the same period, chemists have created numerous new fluoride compounds that are both useful to industry and dangerous pollutants.¹⁴

One of the main reasons that fluoride was an attractive solution for caries was that it would not entail reforming the entrepreneurial, fee-for-service culture that dominated US dentistry. In fact, once freed from the mundane task of filling cavities, dentists could focus on more lucrative periodontic and cosmetic procedures. Furthermore, dentistry would finally have a signature public-health initiative that would elevate the field's overall status within the medical world. Best of all, fluoride—an abundant, highly toxic by-product of the aluminum and phosphate industries—would offer a simple, cheap remedy (albeit only a partial one) to a complex public-health problem. It was a palliative that threatened no substantial economic interests and required no significant changes in dietary practices or food production. In short, it was the classic attempt at solving a complex problem with a cheap technofix.¹⁵



Pro-fluoridation poster released by the Health Education Council during the 1970s. Science Museum, London. Accessed via [Wellcome Collection](#). CC BY 4.0 International.

tolerance of bacteria such as streptococcus. From an ecosystem perspective, the practice is analogous to the monocrop agriculture that is emblematic of modern food systems: artificial fertilizer promotes growth and pesticides kill insects that threaten the crops. In the oral environment, fluoride performs both functions (albeit with less efficacy), aiding in the formation of new enamel and helping destroy the dominant bacteria—the product of monoculture-based diets—that threaten to damage it.

Just as agricultural chemicals pollute the environment with toxins, fluoride—even at the putatively safe levels recommended by dental-health authorities—causes an array of problems in the corporeal ecosystem. For example, early fluoride researchers were concerned about potential bone damage and cataracts that appeared to occur at higher rates in some communities with elevated levels of fluoride in their drinking water. The most visible harm is a dental condition that played a vital role in the discovery of fluoride in some water supplies. In the early twentieth century, dentists were flummoxed by the fact that people in certain communities in Colorado and Texas suffered from badly stained enamel. This, it turned out, was dental fluorosis, a sign of poisoning due to high levels of naturally occurring fluoride in drinking water.

The same communities, however, had relatively low rates of dental caries. After several surveys, dental researchers determined that at one part per million (ppm), fluoridated drinking water appeared to reduce caries rates without significantly staining teeth. But the margin was fine: at 1.5 ppm and above, dental fluorosis began to appear. The difference was the equivalent of a few extra glasses of water per day and did not take into account fluoride from other sources, such as industrial pollution and various foods and beverages. Unsurprisingly, the onset of artificial water fluoridation saw a sharp uptick in rates of dental fluorosis.

In the early years of water fluoridation, in the 1940s and 1950s, its proponents pushed the practice with a fervor that mirrored the zealotry of their antifluoridation opponents.¹⁶ They insisted, for example, that the practice would reduce dental caries by 60 percent. The figure proved highly optimistic and has been revised steadily downward; health authorities now estimate a more modest reduction of 25 percent. What does this figure represent in terms of actual teeth? Each tooth has multiple surfaces that are subject to decay, equaling approximately 100 surfaces in the average human mouth. As near as we can tell (there is no hard data), the average person develops caries on about four of these surfaces per lifetime. A 25-percent reduction means that after a lifetime of drinking fluoridated water, people will experience caries on one fewer tooth surface than would otherwise have been the case. It is not nothing, but it sounds less impressive than a 25-percent reduction would suggest. Dental authorities, it seems, are not above employing the arithmetical vagaries of comparing two small numbers in order to bolster fluoridation's reputation.¹⁷

Inasmuch as fluoride does reduce dental caries, it works by being incorporated into enamel and making teeth more resistant to the acids generated by sugar-fueled microbes. It may also act as an antimicrobial agent, reducing the acid

Fluoridated drinking water appeared to reduce caries rates without significantly staining teeth. But the margin was fine: at 1.5 ppm and above, dental fluorosis began to appear.

Given how desperate dentists and health authorities were to tackle the caries epidemic, one can understand why they were drawn to a solution that in retrospect—and for many at the time—seems problematic. By dosing the water supply they were attempting to thread the needle between fluoride's potential benefits and its demonstrable harm. However, before they could begin, fluoridation's mid-twentieth-century proponents needed to convince a skeptical public that a substance it had hitherto thought of as the main ingredient in rat poison could be safely imbibed on a daily basis. They did this—very successfully, it must be said—by naturalizing fluoride. As Trendley Dean, the so-called father of fluoridation, put it: "fluoridation of public water supplies simulates a purely natural phenomenon—a prophylaxis which Nature has clearly outlined in those communities that are fortunate enough to have about one part per million of fluoride naturally present in the public water supply."¹⁸

Robert Kehoe, a well-known toxicologist at the automobile and chemical industry-funded Kettering Laboratory in Cincinnati, also played an important role in downplaying fluoride's toxicity. He did so by employing the same playbook he had used to justify the continued use of lead in gasoline and paint: both substances occurred naturally and were part of the constant chemical background of life on Earth. Thus, humans were used to them, and putting a little more into the environment would do no significant harm.¹⁹

Naturalizing fluoride brought peace of mind to those who might otherwise have been skeptical of water fluoridation. Dr. Benjamin Spock, the celebrity pediatrician who authored the bestseller *The Commonsense Book of Baby and Child Care* and who became a prominent spokesman for fluoridation, is a good example. Spock conceded that his support ran counter to his general suspicion of chemical additives: "I've always been against the pollution of the diet by the addition of salt and sugar, additives and preservatives to foods consumed by adults as well as children . . . And I've always been against the imposition of regulations on people in an arbitrary, undemocratic manner." Spock also admitted that he was a fluoridation skeptic in the 1940s, but by the late 1950s, he had become chairman of a national committee to educate the public about the value and safety of fluoridation. "What particularly allayed my early doubts about adding a chemical to the public water supplies," he later told readers, "was learning that fluoride has always occurred naturally in water supplies, in various concentrations ranging from seven parts per million in some regions of the Southwest to a mere twentieth of a part per million in some regions of the Northeast. It is a natural, though varying, ingredient in water."²⁰



Carious human teeth. © mariusFM77 on iStock. All rights reserved.

In retrospect, Spock's fluoride flip looks astonishingly gullible. As Kehoe would have happily told him, lead occurs naturally in soil, arsenic occurs naturally in water, and sulfur dioxide occurs naturally in air. Nevertheless, you would not want to be forced to swallow or inhale any of them. And where fluoride is naturally present in water, it is almost never at what dentists consider the optimum level. It is either too little to stave off streptococci or so much that it causes dental fluorosis, or in severe cases, debilitating skeletal fluorosis.²¹ Spock's credulity is a testament to the rhetorical power of what Lorraine Daston and Fernando Vidal refer to as "the moral authority of nature": a "trick that consists in smuggling certain items . . . back and forth across the boundary that separates the natural and the social," thereby imparting "universality, firmness, even necessity—in short, authority—to the social."²²

Spock and other proponents also seemed oblivious to—and strangely uncurious about—the source of all the fluoride that was needed to fluoridate thousands of water systems throughout the United States and beyond. Far from the pharmaceutical grade fluoride that was later added to toothpaste, the substance drip-fed into municipal water supplies is a raw and highly toxic by-product of the phosphate-fertilizer industry.²³ America has always preferred its public health policies on the cheap, and on that score fluorosilicic acid waste certainly delivers. Unfortunately, studies show that fluoride derived from fertilizer production contains metal contaminants, such as arsenic and cadmium, that vary by batch. Yet nobody tests for these contaminants before the chemicals are disseminated into drinking water.²⁴

Far from the pharmaceutical grade fluoride that was later added to toothpaste, the substance drip-fed into municipal water supplies is a raw and highly toxic by-product of the phosphate-fertilizer industry.

Environmentalists are usually the first to sound the alarm when toxic substances are introduced into the water. Yet when it comes to fluoridation, many turn a blind eye, asserting the trustworthiness of institutions that in not dissimilar circumstances they frequently sue.²⁵ What explains this reticence? It is mostly a matter of timing. As environmentalism started to gain political traction in the 1960s and 1970s, fluoridation already enjoyed enormous support among the scientific and policy elite in the Anglo-American world. Furthermore, opponents had been successfully (and in some cases, not undeservedly) stereotyped as Strangelovian kooks: irrational extremists who saw fluoridation as a nefarious communist plot. Expressing skepticism toward fluoridation thus became an increasingly hazardous act if one cared about one's scientific credibility.²⁶

Despite the fact that the world's most influential nation supported the practice, water fluoridation did not readily gain traction in other parts of the world, particularly beyond the Anglosphere. Even today, many people in countries like the United States and Australia are surprised to learn that water fluoridation is practiced in only a handful of places.²⁷ Most European nations prohibit it. There is nothing to suggest that these countries have had worse dental-health outcomes.²⁸ To the contrary, World Health Organization data shows that countries like Sweden, the Netherlands, and France have decreased dental caries at the same rate as the United States but without the concomitant increase in dental fluorosis.²⁹

Recent events suggest that the fluoridation consensus may be beginning to fray. Studies indicate that even at relatively low levels, fluoride is a neurotoxin. Children raised in fluoridated areas in Canada have IQ scores that are 4.5 points lower than their non-fluoridated cohorts.³⁰ In the 1970s, research linking a 4-point reduction in IQ to lead poisoning was enough to finally convince US authorities to ban the practice of adding lead to gasoline and paint.³¹ It is possible that fluoride may be approaching a similar tipping point: in March 2023, after a lawsuit by fluoridation skeptics, the federal government was forced to release a draft report by the National Toxicology Program, a branch of the National Institutes of Health, which casts further suspicion on fluoride's impact on the brain.³² While not yet conclusive, the body of evidence regarding fluoride's neurotoxicity is becoming increasingly difficult to ignore.³³

A small but significant IQ reduction constitutes exactly the kind of elusive effect that fluoridation skeptics warned about from the start. No one was expecting bodies in the street. Rather, opponents in the scientific and medical communities who understood fluoride's biological effects worried that long-term exposure would catalyze an array of chronic conditions that would be hard to distinguish from other illnesses, like arthritis or kidney disease, and that would be difficult to directly attribute to water fluoridation. Such concerns, combined with the unimpressive evidence for water fluoridation's efficacy, makes the practice look increasingly like a relic of a bygone age, an era of incautious scientific optimism summed up by the mid-twentieth-century DuPont advertising slogan, "better living through chemistry."



A phosphate-processing facility. © Brian Brown on Alamy Stock. All rights reserved.

Teeth, particularly those that reside in fluoridating nations, are now firmly part of the agro-industrial system that has transformed much of the planet. Although it is not a pretty picture, there is a kind of satisfying circle-of-life aspect to it: industrial fertilizer grows industrial crops that produce industrial levels of dental caries, which get treated with the waste product of industrial fertilizer. Unsurprisingly, it is hard to write the environmental history of the mouth as anything but a declensionist narrative. In addition to record levels of caries, our modern diets and lifestyles have also given rise to impacted wisdom teeth, malocclusion, weak jaws, small mouths, and altered craniofacial structure.³⁴

As with so many aspects of human health, the cure for our ills lies tantalizingly within reach—in this case through relatively simple dietary and lifestyle changes. And yet, for all the usual reasons—capitalism, inequality, politics, vested interests—the pessimistic historian in me feels that we may never quite grasp it. In which case, water fluoridation, like other suboptimal health schemes, will likely persist. The only foreseeable way that the dental-health community in the Anglosphere might reconsider the practice is if further neurological research continues to demonstrate a robust relationship between fluoride consumption and children's IQs. The fluoridation narrative will be difficult to sustain if parents begin to ask their dentists and doctors: "Why should I risk my child's neurological health just to slightly reduce her chances of getting a cavity?" If that were to occur, then countries like the United States might finally have to admit that tackling dental caries entails more than merely dosing drinking water with a chemical: it requires a sustained, multipronged approach that includes dietary change, reforms in agriculture and food policy, and universal access to dental care. Such actions would have health benefits that go well beyond dental caries. Politically, it will be a tough slog. If it is to happen, however, historicizing the triumphalist narrative of water fluoridation is an important first step.

Notes

- ¹ P. D. Marsh, "Are Dental Diseases Examples of Ecological Catastrophes?," *Microbiology* 149, no. 2 (2003): 279–94, <https://doi.org/10.1099/mic.0.26082-0>. For a brief history of the microbiome concept, see Janet Goins, "Microbiomes: An Origin Story," *American Society for Microbiology*, 8 March 2019, <https://asm.org/Articles/2019/March/Microbiomes-An-Origin-Story>.
- ² Frank P. Cuzzo and Michelle L. Sauter, "What Is Dental Ecology?," *American Journal of Physical Anthropology* 148, no. 2 (2012): 163–70, <https://doi.org/10.1002/ajpa.21656>.
- ³ W. M. Edgar and D. M. O'Mullane, and Colin Dawes, *Saliva and Dental Health*, 3rd ed. (London: British Dental Journal, 2004); Frank A. Scannapieco, "Saliva-Bacterium Interactions in Oral Microbial Ecology," *Critical Reviews in Oral Biology and Medicine* 5, no. 3 (1994): 203–48, <https://doi.org/10.1177/10454411940050030201>.
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- ⁵ Gregorio Oxilia, Marco Peresani, Matteo Romandini, et al., "Earliest Evidence of Dental Caries Manipulation in the Late Upper Palaeolithic," *Scientific Reports* 5, no. 12150 (2015), <https://doi.org/10.1038/srep12150>.
- ⁶ Nicole Nicklisch, Vicky M. Oelze, Oliver Schierz, Harald Meller, and Kurt W. Alt, "A Healthier Smile in the Past? Dental Caries and Diet in Early Neolithic Farming Communities from Central Germany," *Nutrients* 14, no. 9 (2022): 1831, <https://doi.org/10.3390/nu14091831>.
- ⁷ Didier Raoult, Bruno Foti, and Gérard Aboudharam, "Historical and Geographical Parallelism between the Incidence of Dental Caries, *Streptococcus mutans* and Sugar Intake," *European Journal of Epidemiology* 28, no. 709–10 (2013), <https://doi.org/10.1007/s10654-013-9826-7>. The classic work on the history of refined sugar is Sidney Mintz, *Sweetness and Power: The Place of Sugar in Modern History* (London: Penguin, 1986).
- ⁸ Daniel Lieberman, *The Story of the Human Body: Evolution, Health, and Disease* (London: Penguin, 2013), 306.
- ⁹ For a thorough discussion of the impact of modern levels of sugar consumption, see Gary Taubes, *The Case against Sugar* (New York: Alfred A. Knopf, 2016).
- ¹⁰ "Sugar Consumption," *Scientific American* 145, no. 1 (July 1931): 55.
- ¹¹ Alyssa Picard, *Making of the American Mouth: Dentists and Public Health in the Twentieth Century* (New Brunswick, NJ: Rutgers University Press, 2009), 2.
- ¹² This is not the place to tell the long and complicated story of how fluoride came to be dentistry's chosen compound. For a summary, see Frank Zelko, "Optimizing Nature: Invoking the 'Natural' in the Struggle over Water Fluoridation," *History of Science* 57, no. 4 (2019): 518–39, <https://doi.org/10.1177/0073275318809764>.
- ¹³ German chemists claim to have found tiny amounts of pure fluorine entrapped in antozonite, a type of radioactive calcium fluoride found in a mine in northeastern Bavaria. See Jörn Schmedt auf der Günne, Martin Mangstl, and Florian Kraus, "Occurrence of Difluorine F₂ in Nature: In Situ Proof and Quantification by NMR Spectroscopy," *Angewandte Chemie* 51, no. 31 (2012): 7847–49, <https://doi.org/10.1002/anie.201203515>.
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- ¹⁵ For more on technofixes throughout recent history, see Lisa Rosner, ed., *The Technological Fix: How People Use Technology to Create and Solve Problems* (London: Routledge, 2004).
- ¹⁶ Tackling the antifuoridation movement would add more paragraphs to this article than its editors—and readers—are likely to want. A good place to start is Catherine Carstairs and Rachel Elder, "Expertise, Health, and Popular Opinion: Debating Water Fluoridation, 1945–80," *Canadian Historical Review* 89, no. 3 (2008): 345–71, <https://doi.org/10.3138/chr.89.3.345>. For doctoral students in search of a topic, the university archives at the University of Massachusetts at Amherst has a substantial collection of antifuoridationist materials.

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- ¹⁸ Before the House Committee of Interstate and Foreign Commerce with Respect to H.R. 2341 (27 May 1954) (testimony of Dr. H. Trendley Dean).
- ¹⁹ On Kehoe's role in lead, see Gerald Markowitz and David Rosner, *Lead Wars: The Politics of Science and the Fate of America's Children* (Berkeley: University of California Press, 2014). On his part in downplaying fluoride toxicity, see Christopher Bryson, *The Fluoride Deception* (New York: Seven Stories Press, 2004).
- ²⁰ Benjamin Spock, "The Truth about Fluoridation," *Redbook Magazine*, September 1980, 51.
- ²¹ The latter is endemic in parts of India and China. See K. A. Krishnamachari, "Skeletal Fluorosis in Humans: A Review of Recent Progress in the Understanding of the Disease," *Progress in Food and Nutrition Science* 10, no. 3-4 (1986): 279-314; Shreyas J. Kashyap, Ravi Sankannaver, & Gattumane M. Madhu, "Fluoride sources, toxicity and fluorosis management techniques - A brief review," *Journal of Hazardous Materials Letters*, vol. 2, Nov. 2021: 100033, <https://doi.org/10.1016/j.hazl.2021.100033>.
- ²² Lorraine Daston and Fernando Vidal, "Introduction: Doing What Comes Naturally," in Lorraine Daston and Fernando Vidal, eds., *The Moral Authority of Nature* (Chicago: University of Chicago Press, 2004), 1-20, p. 7.
- ²³ In the very early days of fluoridation, the aluminum industry supplied water utilities with sodium fluoride in powder form. From the 1950s onward, fluorosilicic acid, captured by scrubbers on the chimneys of phosphate-fertilizer factories, has been the preferred fluoridation chemical. As a liquid, it is easier to mix into water than fluoride in powder form. Plus, it is the most affordable fluoride waste product available.
- ²⁴ Phyllis J. Mullenix, "A New Perspective on Metals and Other Contaminants in Fluoridation Chemicals," *International Journal of Occupational and Environment Health* 20, no. 2 (2014): 157-66, <https://doi.org/10.1179/2049396714Y.0000000062>; Ciro Capitani dos Santos, Élio Lopes Santos, and Flávia Gonçalves, "Evaluation of Contaminants in Fluorosilicic Acid Used for Public Water Fluoridation in the Santos Region, Brazil," *Water Supply* 17, no. 4 (2017): 921-28, <https://doi.org/10.2166/ws.2016.191>.
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- ²⁶ Catherine Carstairs, "Debating Water Fluoridation before Dr. Strangelove," *American Journal of Public Health* 105, no. 8 (2015): 1559-69, <https://doi.org/10.2105/AJPH.2015.302660>. High-profile scientists and activists like Paul Ehrlich and Ralph Nader expressed skepticism about water fluoridation but seemed reticent to wade too deeply into the fluoride wars. See Zelko, "Optimizing Nature."
- ²⁷ In addition to the United States, other nations in which the majority of the population drinks artificially fluoridated water include Australia, New Zealand, Singapore, Ireland, Malaysia, and Chile. Israel adopted the practice in 2002 but discontinued it in 2014.
- ²⁸ Mark Diesendorf, "The Mystery of Declining Tooth Decay," *Nature* 322 (1986): 125-29, <https://doi.org/10.1038/322125a0>. In recent years, a few countries, such as Germany and France, have authorized the addition of fluoride to salt, although non-fluoridated salt is also readily available.
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- ³¹ See Markowitz and Rosner, *Lead Wars*.
- ³² NTP Board of Scientific Counselors, *NTP Board of Scientific Counselors Working Group Report*, 16 May 2023, https://ntp.niehs.nih.gov/sites/default/files/2023-05/BSC_WG_Report_Final_Version_BSC_approved051623_508.pdf.

³³ P. Grandjean, "Developmental Fluoride Neurotoxicity: An Updated Review," *Environmental Health* 18, no. 110 (2019), <https://doi.org/10.1186/s12940-019-0551-x>.

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ECOLOGICAL CONSTITUTIONALISM: A NECESSITY

Jens Kersten

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Jens Kersten

It is no longer a new idea to state that we are living in the Anthropocene—an era in which humanity has become a force of nature.¹ But when we look more closely, it is not humanity as a whole, but primarily the Global North that is responsible for the negative developments of the Anthropocene, such as species extinctions, the climate crisis, and the pollution of the planet. To be able to mitigate these ecological problems, we must radically change our daily living habits as well as our economic system. The states of the Global North must therefore transform their legal systems in accordance with ecological constitutionalism, for law is the tool by which we can shape our society and economy, and, ultimately, make them ecological.



On 24 March 2021, Germany's Federal Constitutional Court officially demanded that the German government take much more effective measures against climate change by considering the impacts also on the younger and future generations. © picture alliance/dpa | Uli Deck. All rights reserved.

Importantly, such transformation is essential because it was the constitutional developments of the Global North that encouraged the catastrophic events of the Anthropocene in the first place.² The liberal constitutions of so-called Western countries emerged in the wake of the late eighteenth-century bourgeois revolutions. They guaranteed individual freedoms, the protection of property, and the freedom of economic activity—fundamental rights that formed the constitutional foundation for the colonial exploitation of people, cultures, and the nonhuman world. The Industrial Revolution of the nineteenth century, moreover, gave additional impetus to this development. In response to the “social question” of industrialization, the liberal constitutions were transformed into welfare-oriented constitutional orders. Thus, the welfare states of the Global North—with their capitalist economies,

their high energy and resource usage, and their industrial food production—came into existence, which further accelerated the global destruction of the environment. As a result of this “Great Acceleration” of the Anthropocene, the “ecological question” we are facing today is of relevance on a global scale.³

It is not humanity as a whole, but primarily the Global North that is responsible for species extinctions, the climate crisis, and the pollution of the planet.

Due to their enormous responsibility for the developments of the Anthropocene, it is the states of the Global North that must answer this “ecological question.” Such an undertaking can only be successful if a *third* revolution follows the bourgeois revolution of the eighteenth century and the social revolution of the nineteenth and twentieth centuries: an ecological transformation of the liberal and welfare-oriented constitutional orders.

In the face of the challenges of the Anthropocene, it is insufficient for the states of the Global North to merely adopt constitutional provisions that are intended to protect the environment. Rather, what we need is ecological transformation on a larger scale—a transformation of the entire social and constitutional orders of the states of the Global North, which is at the heart of ecological constitutionalism.⁴ Ecological constitutionalism calls for changes to each of the four parts that make up the classic constitutional orders of these states: the preamble, the declaration of fundamental rights, the constitutional principles, and the structure and organization of the state. Each of these parts must develop an ecological profile.

Ecological Preambles

In their preambles, the constitutions of the Global North should expressly recognize their responsibility for the health of the planet.⁵ Preambles lay out the intentions and purpose of the constitutional order. Ecological responsibility must become a central element of the promise enacted by a constitution. This might, for example, take the form of preambles that not only promise to safeguard individual freedom, social prosperity, and global peace, but also declare responsibility for planetary health to be an equally important goal that is to be realized through the democratic shaping of the state, the economy, and society.

Ecological Fundamental Rights

To fulfill the ecological promise of the preambles, the constitutions of the Global North will need to make three key changes in their declarations of fundamental rights.⁶

First, it is necessary to recognize new ecological fundamental rights. An example of this is the introduction of a right to ecological integrity. To achieve this, the right to life and health that is guaranteed in virtually all constitutions of the Global North is to be extended to include an ecological dimension. Citizens would have a right to an intact environment and the preservation of the natural basis for their lives and livelihoods.

In addition to this right to ecological integrity, a right to ecological information must be formally recognized at a constitutional level. This right means that states must inform the public about ecological developments in a transparent and systematic manner. It would be implemented not only through the educational system, but especially by scientific agencies and institutes, via the internet and social media, and, above all, by disclosure requirements for commerce and industry. To meet this constitutional obligation, laws could be passed that, for example, require companies to provide public reports about the sustainability (or lack thereof) of their structures and management. The

goal of this is an ecological-structural transformation of the public sphere that would prevent active and passive ignorance in regard to the challenges of the Anthropocene.

An “ecological obligation” must be added to the social obligation—particularly to the right to property—in the constitution.

Second, it will be necessary to modify some existing guarantees of fundamental rights by imposing effective ecological limitations on freedom. There is no alternative. This applies in particular to economic freedom and the right to property, which play a central role in the capitalist societies of the Global North. While it is already possible to restrict economic freedom and right to property for the protection of nature and the environment, developments like species extinction, the climate crisis, and global pollution make clear: such measures are not effective enough! For this reason, an “ecological obligation” must be added to the social obligation⁷—particularly to the right to property—in the constitution. For it is only by linking the “social question” and the “ecological question” that it will be possible to transform our social order into a “social eco-state.”⁸

This seems all the more urgent in light of the way that the social and ecological question are played off against one another today. Particularly in the states of the Global North, the social question had long been suppressed in the context of neoliberal structural transformations. Now, defensive political strategies have “rediscovered” the social question but as a means to fend off the ecological question rather than to wholeheartedly adopt the cause of social well-being: citizens—so it is claimed—cannot afford an ecological lifestyle. When looked at more carefully, however, this argument does not hold water.⁹ Rather, it shows that an ecological transformation of our social order cannot be successful without a fundamental social transformation: ecological politics are social politics—and vice versa!

Third, the constitutional orders of the Global North must recognize the rights of nature.¹⁰ Here the states of the Global North could learn from pioneers in other parts of the world—for example, the constitution of Ecuador, which in 2008 recognized nature as a legal subject and granted it specific rights (Article 10 § 2 in conjunction with Articles 71-74 of the Constitution of Ecuador). Here, the provisions of Article 71 programmatically proclaim: “Nature, or Pacha Mama, where life is reproduced and occurs, has the right to integral respect for its existence and for the maintenance and regeneration of its life cycles, structure, functions and evolutionary processes.” And it continues, “All persons, communities, peoples and nations can call upon public authorities to enforce the rights of nature.”¹¹ The states of the Global North could draw inspiration from these highly innovative provisions and incorporate rights of nature into their own constitutions.



In 2018, ten years after Ecuador incorporated the rights of nature in its constitution, the International Rights of Nature Symposium took place in Quito. © 2018 Global Alliance for the Rights of Nature. All rights reserved.

The introduction of rights of nature extends beyond the possibility of giving ecosystems rights. In addition, individual ecological persons—such as animals or charismatic (e.g., endangered) plants—might be recognized as having rights that can be enforced through legal claims: for example, the right to personal integrity and shelter (ecosystems) or even the right to property. In this way, the body of legal persons is expanded, simultaneously giving more momentum to the development of ecological rights. For possessing subjective rights means setting the legal order into motion in one's own interest or on behalf of others.¹² Thus, nature—just like people or corporations—can start legal disputes: not only to protect its own ecological rights but also to spur on the further development of the legal order as a whole. This dynamic activation of ecological law is at the heart of ecological constitutionalism: ecological rights lead to ecological legal disputes, which in turn result in developments in ecological law.

Ecological Sustainability as a Constitutional Principle

Similarly, in the formulation of their constitutional principles, the states of the Global North will need to make two changes in order to fulfill the ecological promise made in the preambles.¹³ First, ecological sustainability is long overdue to be recognized alongside principles such as democracy, rule of law, welfare, and federalism as one of the foundations of a constitutional state. In this way, ecological sustainability—coupled with other constitutional principles—would fundamentally shape the state structures and the social politics of the Global North. Second, the principle of ecological sustainability should be embedded in the constitution in the form of concrete state goals. Such state goals in constitutions guide the decisions and measures that are to be enacted by the legislative, executive, and judicial branches.

Accordingly, ecological state goals can declare that animals, and nature more generally, are to be respected and protected, that biodiversity is to be preserved, and that the oceans and climate are to be safeguarded. Additionally, ecological state goals should have a programmatic function, codifying the need to ensure environmentally sound living conditions for both present and future generations. This allows the integration of the environmental justice principle into constitutional orders and its implementation at local and national levels.¹⁴ Furthermore, the principle of

environmental justice gains a transnational dimension: by anchoring it in their national constitutions, the states of the Global North commit themselves to acting in accordance with their ecological responsibility vis-à-vis the Global South.

Ecological State Structures

In their provisions laying out the structure and organization of the state, the constitutions of the Global North must assign ecological duties and functions to all organs of the state.¹⁵ This is necessary because the ecological transformation of the social order will be managed by governments and parliaments using democratic laws. By shaping society through legislation, these bodies hold a wide scope for decision-making and discretion. However, to ensure that governments and parliaments do not dismiss ecological concerns as being of less weight than social and economic interests, the structures of these bodies must themselves be ecologized.

Scientific experts should be involved much more closely in parliamentary work to ensure that ecological policies and legislation are based on professional advice and expertise.

Such an ecological reconfiguration of state-organization law can be implemented, for example, by requiring parliaments to debate their annual budget not merely in terms of financial policy but ecological policy as well. This way, the government must justify its current and future ecological policies before parliament and thus before the political community. In addition, scientific experts should be involved much more closely in parliamentary work to ensure that ecological policies and legislation are based on professional advice and expertise. Another measure to serve this goal is the appointment of independent ecological parliamentary commissioners who are granted broad investigative authority and rights to information. Finally, an innovative measure would be to endow already established forms of digital rights to petition with an ecological dimension: not only citizens but also ecological subjects of rights would be able to sign digital petitions in order to introduce ecological issues to the parliamentary agenda. In this way, ecological actors can speak with their own legal voice, to represent their interests in the political process.

In addition to parliaments, the executive branches of government must also develop an ecological profile. Thus, it would be desirable for ecological constitutions to require governments to explicitly formulate ecological guidelines that their policies must follow. Furthermore, the minister of the environment may be given a veto right for all government decisions that are of ecological significance. Finally, the heads of state of the Global North, whether ceremonial or elected, should be assigned an explicit responsibility for the ecological well-being of society as part of their constitutional duties. This can translate into a requirement, for example, that the heads of state create a council for sustainable development. Within these councils, both independent scientific experts and environmental activists should be represented, with the purpose of making recommendations about the continuing ecological transformation of society.

Taking Future Rights Seriously

The suggestions outlined here form a constitutional-law framework for shaping an ecological transformation of the social orders of the Global North. From a constitutional-law standpoint, one key concern is developing ecological “right[s] to a future.”¹⁶ A glimpse of what this could look like can be found in a revolutionary decision by Germany’s Federal Constitutional Court on 24 March 2021.¹⁷ Based on the fundamental right to a future consistent with human dignity guaranteed in the German constitution (Article 2 § 1 in conjunction with Article 20a), the judges recognized an

obligation to the intertemporal guarantee of freedom with respect to climate-protection measures. In other words: in the face of the climate crisis, the state is obliged to distribute the restrictions on freedom resulting from climate-change mitigation measures equitably across generations, rather than shifting this to the (near) future to the detriment of future generations. With this decision, the Constitutional Court opened up a future-oriented perspective in constitutional law that can also be applied to ecological questions in other areas of life—for example, by recognizing the right to the intertemporal equity of current and future generations with respect to available natural resources or by recognizing the right to intertemporal access to biodiversity.

As this final example makes clear, ecological constitutionalism involves a far-reaching transformation of the social and legal orders of the states of the Global North. But it is a task that we must embark on if we are to take on responsibility for the ecological consequences of our past and current actions while fulfilling our obligations to the future.

Notes

¹ Paul J. Crutzen, "Geology of Mankind: The Anthropocene," *Nature* 415 (2002): 23.

² Jens Kersten, "Die dritte Revolution: Für ein ökologisches Grundgesetz," *Blätter für deutsche und internationale Politik* 6 (2022): 91–102, pp. 92–93. On the Great Acceleration, see J. R. McNeill and Peter Engelke, *The Great Acceleration: An Environmental History of the Anthropocene since 1945* (Cambridge, MA: The Belknap Press, 2014).

³ Will Steffen, Jacques Grinevald, Paul Crutzen, and John McNeill, "The Anthropocene: Conceptual and Historical Perspectives," *Philosophical Transactions of the Royal Society* 369 (2011): 842–67, p. 849.

⁴ James R. May and Erin Daly, *Global Environmental Constitutionalism* (Cambridge: Cambridge University Press, 2015); Louis J. Kotzé, *Global Environmental Constitutionalism in the Anthropocene* (Oxford and Portland, Oregon: Hart, 2016).

⁵ Jens Kersten, *Das ökologische Grundgesetz* (Munich: C. H. Beck, 2022), 59–91.

⁶ Kersten, *Das ökologische Grundgesetz*, 72–109.

⁷ Jörg Leimbacher, *Die Rechte der Natur* (Basel, Frankfurt: Helbing & Lichtenhahn, 1988), 268.

⁸ Ulrich Becker, "The Social Eco-State," in *Liber Amicorum Danny Pieters: Durven out of the box denken*, edited by Paul Schoukens, Bert Demarsin, Eleni de Becker, and Thijs Keersmaekers, 70–76 (Gent: Owl Press, 2022).

⁹ See Kersten, *Das ökologische Grundgesetz*, 6.

¹⁰ Andreas Gutmann, *Hybride Rechtssubjekte: Die Rechte der "Natur oder Pacha Mama" in der ecuadorianischen Verfassung von 2008* (Baden-Baden: Nomos, 2021).

¹¹ Constitution of the Republic of Ecuador, chap. 7, art. 71.
<https://pdpa.georgetown.edu/Constitutions/Ecuador/english08.html>.

¹² Georg Jellinek, *System der subjektiven öffentlichen Rechte*, 2nd ed. (Tübingen: Mohr Siebeck, 1905), 51, 56–7.

¹³ Kersten, *Das ökologische Grundgesetz*, 111–18.

¹⁴ Eva-Maria Isabell Ehemann, *Umweltgerechtigkeit: Ein Leitkonzept sozio-ökologisch gerechter Entscheidungsfindung* (Tübingen: Mohr Siebeck, 2020).

¹⁵ Kersten, *Das ökologische Grundgesetz*, 133–67.

¹⁶ Constanze Janda, "Sozialstaat for Future: Der Klima-Beschluss des BVerfG und seine Bedeutung für die Sozialgesetzgebung," *Zeitschrift für Rechtspolitik* 54 (2021): 149–53, p. 149. See also Jens Kersten and Elisabeth Kaupp, "Die Verfassung einer prospektiven Gesellschaft: Wie zukunfts offen ist das Grundgesetz?," *Juristische Schulung* 62 (2022): 473–82, pp. 478–9.

¹⁷ Bundesverfassungsgericht, "Beschluss vom 24.3.2021 – BVR 2656/18, 78, 96, 288/20," in *BVerfGE* 157, 30–177.

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ADVENTURES IN MOCKSTITUTIONS

Jenny Price

Springs
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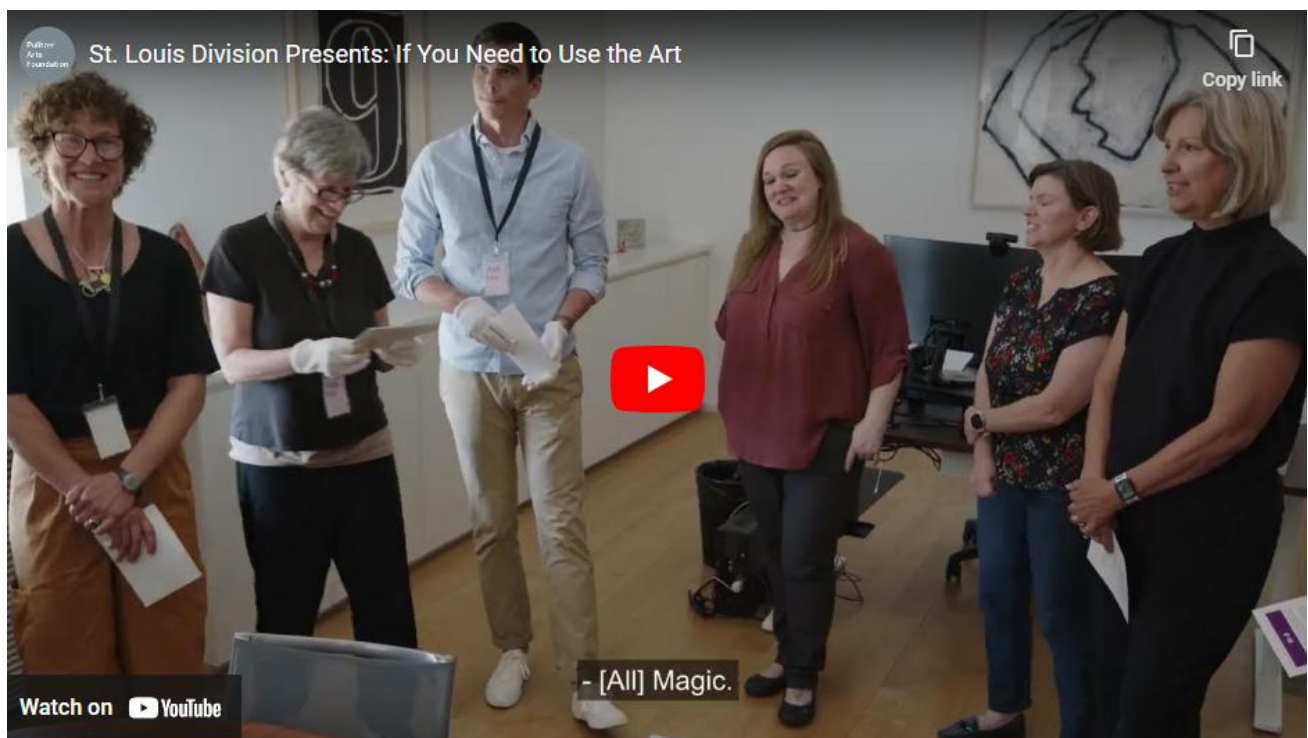
4 • 2023

Jenny Price

“Welcome to the next stop on our tour today—TOILET—which is on permanent display in the museum and yet very often gets overlooked. TOILET is a great example of the genre of participatory art, and you can think of it as a tiny portion of a much larger participatory piece—City of St. Louis Water Infrastructure.”

So I explained as I co-led a tour of the Pulitzer Arts Foundation museum. The tour, titled “If You Need to Use the Art,” was designed by my creative-practice collective St. Louis Division; it was commissioned by the Pulitzer, and it entirely and intentionally ignored the art.

“If You Need to Use the Art” is an alt-institution public art project—or a mockstitution, to use artist Gregory Sholette’s moniker. These projects mimic the language, iconography, and norms of established entities—a public agency, a museum, a digital platform, a global corporation. They challenge accepted ideas and policies, while deputizing the entity’s acknowledged powers to document, mandate, and communicate. Mockstitutions evoke the familiar, and then turn it on its head. Are you trying to explode deeply rooted assumptions about environment or history or both? An alt-institution might prove useful. Are you asking people to think differently about definitions of the environment, public conservation policies, or even (gasp) the institutional norms in the environmental humanities? Your inner artist might be calling.



Alt-institution projects have exploded in the 2000s. Think [Yes Men](#), as an especially well-known and brilliant example, and by all means check out their [“Coal for the Rich”](#) project, which mimics the Chicago power company Midwest Generation—and announces the siting of a coal-fired plant in the wealthy South Loop. Or look up [The Natural History Museum](#), which aims to radically transform how we think and talk about nature. Shouldn’t mockstitutions be especially useful for environmental-humanities scholars, who challenge such deeply entrenched cultural assumptions and such broadly consequential public policies? These projects tend to be a lot of fun—and also deadly serious. Some projects are solo, but most are collaborative.

I myself accidentally careened down the alt-institutions rabbit hole in 2004 when my friend Emily Scott—then a student and now a much-lauded art historian—asked me to join the Los Angeles Urban Rangers, which we intended as a one-off project. We would remain on duty for 10 years. Why dress up as park rangers—green pants, khaki shirt, hiking boots, and the iconic big hat—beyond the fact that the hat was so much fun to wear? We deputized a historically beloved US character—an expert on nature, and the guardian of “America’s great public spaces”—to challenge assumptions about “nature,” to reclaim public spaces, and to showcase the inequities of access to both public sites and healthy environments. We deployed the ranger’s iconic qualities—expertise, inclusiveness, gee-whiz curiosity, and infallible good cheer—to inform and persuade, as well as to defuse conflict in contentious spaces.

We deputized a historically beloved US character to challenge assumptions about “nature,” to reclaim public spaces, and to showcase the inequities of access to both public sites and healthy environments.

As ersatz park rangers, we led expeditions to the contested Malibu public beaches, where private homeowners have historically chased public beachgoers off public sands. We organized “corporate peaks and meadows” hikes through Los Angeles’s highly privatized downtown commercial center, where we tried our best to explain the Byzantine public easements. We hosted a “Pop-Up Water Bar,” with two flights of water varietals—one tap, and the other bottled—to showcase the highly inequitable geographies of who drinks the cleanest and most polluted water in the LA area. Why not be Ranger Jenny? I learned so much from my first alter ego—and from wearing the hat—which I’ve since tried to apply to a range of solo and collective mockstitution adventures.

Which brings me back to St. Louis Division, my newest collaboration, which I cofounded a few years ago, with two new partners, in crime after I moved back to my hometown St. Louis in 2016. We aim to explore hidden social and environmental geographies in a metropolis that’s famous historically both for racial divisions (Dred Scott, Ferguson, the list goes on) and toxic manufacturing (Monsanto, uranium processing for the Manhattan Project, and much more). Why dress up as an Environmental Protection Agency (EPA) administrator—black pants, plain shirt, black sweater? Our launch project, “Superfun!” is a darkly satiric mockstitution. It closely mimics the website of the federal Superfund program—the EPA initiative that facilitates the cleanup of the most supremely toxic sites across the country. Our “Superfun!” program, by contrast, “measures, documents, and promotes the substantial everyday FUN facilitated by the widespread manufacture and use of toxic industrial products, and by the clean-up of ultra-toxic chemical and nuclear waste.”

“Superfun!” aims to showcase common fallacies about industrial toxics. By connecting Superfund sites to quotidian fun—think cars, toys, clothes, paints, and basically every industrial product—we emphasize how extreme toxicity, while highly inequitably distributed, is in fact endemic to everyday life in the US. We also showcase how the Superfund program actively fuels our grossly inequitable and sky-high-polluting economy, which generates the jaw-dropping toxicity in the first place. If you’re familiar with the official Superfund site, you’ll understand why the Superfun! site includes four goals, a site map with candy icons, and a How-Fun Ranking System, as well as a background Fun Story for each of a dozen Superfun! sites in the St. Louis region.¹



Why dress up as an art-museum docent—black pants, nice black shirt, big arty jewelry? St. Louis Division's next project has been my most recent mockstitution adventure. "If You Need to Use the Art," though, doesn't actually mimic a tour of an art museum in order to critique the institution itself. Rather, we deploy this familiar guided-tour genre, along with the well-known trope of art appreciation, to ask people to think critically about the city. The tour visits five "artworks"—the air filter in the mechanical room, a toilet in the bathrooms, our W-9 tax forms in the director's office, the break room, and the redevelopment district (land art!) you can see from the outdoor mezzanine. Why is the air so polluted? Where does the water come from, and where does it go? How do our artist fees become Exxon stock? Who empties the trash? How do redevelopment policies remake urban environments, and for whom? Air, water, money, labor, governance. We ask museumgoers to visualize and appreciate these often highly problematic networks. How do they shape the museum and how you experience it—and also how you experience the city?

My favorite moment on the tour? When we sweep people from the quiet hush of a museum gallery into the clanking chaos of the mechanical room; also, when my colleague Aaron and I don white gloves to carefully remove our W-9s from a manuscript box while our colleague Allana talks about the magical realism of money.

My all-time favorite mockstitution moment? In 2010, when the Mountains Recreation and Conservation Authority, an unusually progressive public parks agency, hired the LA Urban Rangers to teach their own rangers what we knew about public beach access in Malibu.

The real rangers hired the ersatz rangers.

Mission accomplished.

Notes

¹ I'm eager to include here that I performed Superfun! on a 2022 American Society for Environmental History panel, "Institutional Disasters," with two brilliantly funny environmental-humanities friends—both of

whom I first met through the Rachel Carson Center. Nicole Seymour spoke as a sales rep for her mockstitution Anxietero—a digital platform that universities can use to outsource the management of students' climate anxiety—which satirized and critiqued the academic-software economy, not to mention university priorities writ large. Rob Gioielli, dressed as a 1960s-era Ohio State Highway Department engineer, explained at a public hearing how a new highway was of course going to devastate a low-income community of color.

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NOT EVERY KID IS WEIRD: A CONVERSATION WITH FRANCESCA MEZZENZANA

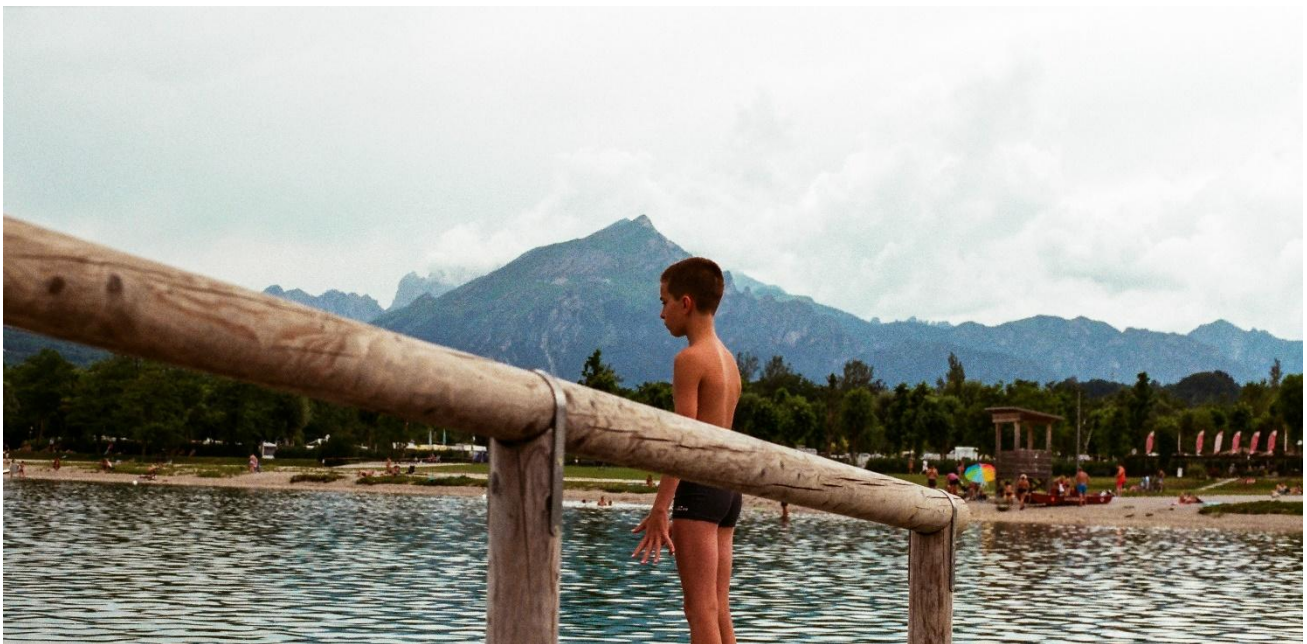
Francesca Mezzenzana and Brady Fauth

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Francesca Mezzenzana received a PhD in anthropology from the London School of Economics. Her current research project, [LearningNatures](#), investigates children's human-nonhuman relationships across cultures. In addition to her numerous academic publications, Francesca has contributed to Aeon, Süddeutsche Zeitung, and Slate Magazine. She has conducted fieldwork in the Ecuadorian Amazon since 2011 and in Italy since 2019. Brady Fauth is an editor at the Rachel Carson Center and a writer in his spare time. He has continued to find ways to get lost in the same field behind his childhood home since 1993. Together, they discuss the inspirations and trepidations of a research project spanning three continents.



A boy is ready to jump in a lake, Santa Croce Lake, Italy. © Elena Palma. All rights reserved.

BRADY FAUTH: The concept of your new project, *LearningNatures*, seems to be quite novel, bringing together methods of anthropology, psychology, and philosophy to investigate, cross-culturally, how children speak about and interact with the nonhuman world. As an anthropologist, what were you working on before *LearningNatures*, and what aspects of your previous research led you to this new project?

FRANCESCA MEZZENZANA: Before working on this project, I was a Marie Skłodowska Postdoctoral Fellow at the University of Kent, where I researched children's development of something that I call "environmental empathy"—the relationships of care toward the nonhuman world. I was led to my current project by my interest in animism, in particular in the Amazonian region, which was the topic of my doctoral dissertation at the London School of Economics. Animism—that is, a form of knowing and understanding nonhuman others that recognizes their intelligence, emotions, and, ultimately, animacy—is characteristic of many Indigenous societies in lowland South America, including the Runa, with whom I have the privilege to work in the Ecuadorian Amazon. However, this broad depiction might lead to the impression that Indigenous people impute life indiscriminately on all sorts of beings.

BF: This sounds like an interesting way of conceptualizing different understandings of the nonhuman world, but do such depictions become more complicated when you look at actual instances of these interactions in the field?

FM: During my own work, I have observed how different people may readily detect characteristics such as life and intentions in some nonhuman entities but not in others. For example, people might claim that some entities, such as certain types of trees, are capable of thinking, whereas different tree species are not. That's when I began to think that I needed more tools, beyond the ones I had as an anthropologist, to investigate a phenomenon of this complexity. And this is how I got interested in cognition and psychology and the precise instruments these fields offer to map the ways in which people reason about the world. Together with anthropological methods, I believe these other fields provide powerful tools to think about these issues. At the same time, another question began to take shape for me: How does this way of relating to the nonhuman world develop? You and I are very likely to have a relationship to the natural world that is pretty different—although not always—from that of my Runa friends and collaborators. The question for me is: Why? How do certain differences—and similarities—evolve? The answer for me can only be found by looking at children and how they are socialized in what, as coined by psychologist James J. Gibson and applied by anthropologist Tim Ingold, is called the “education of attention.” That is a way of learning to attend, to perceive, and to notice.



A boy petting a horse, Alto Biobio, Chile. © Elena Palma. All rights reserved.

BF: Thinking about this “education of attention,” and not just what we learn but perhaps what we don’t learn, there has been [a study, published by the World Economic Forum](#), on what they called “nature-deficit disorder,” which reports that 83 percent of children between the ages of five and 16 in the UK, out of a polled group of 1,000, could not identify a bumblebee. Does something like this factor into the research you’re doing?

FM: I am not sure I would trust any study carried out by the World Economic Forum, an institution that represents the elites of the world and as such has a very specific political agenda. But let’s see: so, we have a great majority of children not recognizing a bumblebee, yet another study I know shows that they are quite good at identifying [every type of Pokémon](#)! The results are not very surprising. They really are an indication of what we value as a society. The natural world is obviously not high on the agenda, as we are increasingly seeing with the way the climate crisis is being handled by current governments. However, I profoundly dislike the pathologizing tone that characterizes a term such as “nature-deficit disorder.” It reduces what is a product of a social and economic issue to an individual deficit, a kind of syndrome to which parents—which usually means mothers—should find a solution. Children are not outdoors because they are going to school. Children are

not outdoors, at least among the middle classes of postindustrial societies, because they don’t need to help with household work, which, in other contexts, involves doing agricultural work—animal husbandry, fishing, etc. Children do not know about plants or animals because of the way our food is made. This so-called disorder is a product of a historical and socioeconomic shift and should be conceived as such. Right now, the prevailing answer to this perceived deficit is: bring the children outdoors.

BF: And I take it you don’t find this answer satisfying?

FM: Increasing time outdoors, having “wild kindergartens,” *Waldkindergärten* here in Germany, won’t change how we interact with the natural world mainly because this relationship is shaped by larger socioeconomic forces—shaped by the free market, which determines the value of natural resources and thinks of people in terms of profit. Just “going outside” doesn’t consider for instance how access to natural spaces is correlated to socioeconomic class: poor children from minority populations are the least likely to have access to natural spaces. And it’s not just that. Sure, you can

bring children outdoors so that they move around, enjoy the beauty of the world, and discover wonders, but any benefits this might have are only going to be individual and temporary. Honestly, what I find truly concerning is not that some children in the UK might be spending little time outdoors, but rather that millions of children are denied access to water, food, and land, and that in 20 years' time, with the climate crisis, the situation will be even worse. The two things are linked, but in the first case the problem is phrased in a way that leaves no space for a proper analysis of how the roots of the problem lay in capitalism. So perhaps, yes, sure, take the children outdoors, but also bring them to a strike!

What I find truly concerning is that millions of children are denied access to water, food, and land, and that in 20 years' time, with the climate crisis, the situation will be even worse.

BF: That's a good idea. Well, now that you've touched upon some of the complexities your project deals with, could you tell us about some of the places you intend to go, and about the members of your team that will go there?

FM: Well, we are quite a diverse team: there is me, trained as a social anthropologist, James who is a philosopher, Elena who has a background in literature and anthropology, Amey who has a background in art, ecology, and animal cognition, Franks who is a native Runa researcher with expertise in ethnographic methods, and Andrea from Argentina who is a cognitive psychologist. Each of us is going to go to different field sites. Elena is going to do fieldwork in Chile, among the Pehuenche, an Indigenous community in the Biobío Region that is actively seeking to restore their relationship to the Biobío River after the construction of a dam by the Italian energy company Eni. Amey is going to do research in wilderness programs for children in New York State, attended mostly by white middle-class children. I will be doing fieldwork in a few informal ecovillages in the Apennines in Italy and will also continue my work in Ecuador. But it will be Franks, with whom I've been collaborating on a number of projects, who will take the lead on the research in Ecuador. So, we have a very diverse range of field sites. What all these places have in common is that at each site there is a strong commitment to envisioning a different relationship to the nonhuman world as well as to thinking that pedagogy plays a fundamental role in the process.



A mantis on a child's hand, Altovincenzo, Italy, © Elena Palma. All rights reserved.

BF: I would imagine that, before you venture out into the field, there are some basic concepts and methodologies you'll want to settle upon for your research. Have you already begun this planning, and, if you have, do you presently foresee any major obstacles to the process?

FM: We are doing this conceptual and methodological work right now. As an interdisciplinary team, we have people coming from very different backgrounds. This means that we are constantly debating, arguing, and thinking about even seemingly basic questions such as "What do we count as evidence of X?" Of course, these are never easy questions. But if you only work with colleagues from the same discipline, you tend to forget about the difficulty of such questions, because you are more likely to share certain assumptions about what evidence is and how it satisfies certain requirements. This is not at all the case for our group. I would say we are all learning to understand each other—and the specific language of another discipline—and to be humble in face of other people's knowledge. It has been an enriching and challenging journey!



Two children looking at a worm on the ground, Altovicerio, Italy. © Elena Palma. All rights reserved.

BF: And what age group will your research focus on?

FM: We will be focusing on children between the ages of three and 10, but, of course, what we will be looking at and the methods we will employ for each age group will differ. We will be looking at this age range because profound steps in conceptual development are supposed to occur in this period—for instance, the emergence of anthropocentrism, here understood as the construal of the category of humans as distinctive from other animals. The latter, for instance, has been thought to emerge in early childhood, but [recent research](#) suggests that, in fact, anthropocentrism might not be an innate cognitive disposition but rather something that children learn. This is why I think it is exciting to look at different age groups, contrasting especially preschool and school children. Personally, I will be looking at infants too. I find infancy and early childhood, between zero and three, particularly interesting because of the cultural importance these years seem to hold in our own society.

BF: Can I go one, perhaps philosophical, step further, then, and ask how you begin to define what is even understood to be a child, based on the broad array of cultures you intend to survey?

FM: What a child is—what is considered appropriate for a child to do, what a child can actually do—is certainly something that we are thinking about in the team. In fact, we would even

challenge the notion that we already know what a child is and instead argue that we should start from a very minimal definition of childhood—one that allows us to have a meaningful conversation with colleagues in psychology! So, in our work we start from the basics: who is called a child, say, in a Pehuenche community in Chile today? What qualities are emphasized in children? What do they do? What do they not do? How are they cared for? Basically, we try to get rid of our own assumptions of what a child should look like to examine on the ground what being a child in a given place means. This is not the approach taken in mainstream developmental psychology where cultural differences are not taken into account and where most of the research is conducted in what are commonly known as [WEIRD](#) societies—that is, Western, Educated, Industrialized, Rich, and Democratic. Yet the results from this group are often applied to the rest of the world. We urgently need to go beyond WEIRD conceptualizations of childhood, and this is important because by looking at children in their specific contexts, we can avoid making normative and patronizing claims about what type of care they should receive.

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BF: Great that you mention WEIRD societies! In some of your published works, such as [the piece you wrote for Aeon](#) this summer, you have reflected on your own anxieties in learning to adapt to new methods of parenting that were entirely dissimilar from your experiences and expectations. Do

you think the cross-cultural research that LearningNatures intends to undertake might also be useful to parents and caretakers?

FM: The project has a strong focus on childcare practices. In fact, it is not just about how children interact with the natural world but also about how adults or caretakers—who might not be necessarily grown-ups—explicitly or implicitly teach children and how they interact with them. For instance, the way in which an environmental educator teaches a child about plants will necessarily reflect assumptions about what children are, how they should be taught, and how they should not be taught in that given subgroup of the studied population. In the case of Amey, who will be doing fieldwork in the US, I would predict that interactions between adults and children will involve a lot of verbal exchanges, explanations, and what is called “emotion talk”—talk that focuses on interior feelings and experiences. These are not standard universal communication practices but rather patterns of interactions that are culturally specific to Euro-American middle-class child-adult relationships. I think these interactions will look very different in a place like the Ecuadorian Amazon or the Biobío Region in Chile. It will therefore be inevitable to think about childcare practices in a cross-cultural perspective. So, in that way, I hope that some of the work we will be doing might be useful or at least interesting to parents who will read our research.



Children playing on hay bales, Altavice, Italy. © Elena Palma. All rights reserved.

BF: Let's bring this idea closer to home. We're currently in Germany. Have you observed any practices or methods from German caretakers or educational institutions trying to teach “nature” that you think are worth noting?

FM: It's not exactly teaching about nature, but I think there is a more relaxed approach to the “risks” inherent to playing and being outdoors. German parents, or the ones I have met here in Munich, seem to tolerate a certain degree of risk inherent to playing outdoors. The playgrounds, for instance, do not seem to be designed to eliminate every possible risk of falling or injuring oneself—at least in comparison to my experiences in Italy and the UK. And risk is really important because it raises a lot of questions both in relation to child-nature relationships and to childcare more broadly. Particularly as we live in a society averse to risk, and especially when it comes to children, it is

interesting how this idea of allowing minimal risks is associated with a kind of nature-oriented education. For instance, *Waldkindergärten* often emphasize that being outdoors necessarily brings some risks and that children should be free to experience them—and, in fact, that this is good for child development. I wonder how much of this higher tolerance for risk here is related to a German romantic idea about spiritual strength through physical resilience. And I am thinking now of the idea of *Naturmenschen* like Gustav Gräser or Otto Gross, who lived nearby, here in Munich Schwabing, more than one hundred years ago, and who often trekked to Switzerland together with people like psychologist Carl Gustav Jung, bathing in cold rivers and dressing themselves scantily in the hostile weather in an effort to become stronger and more resilient! I find this kind of socially influenced performance of identity and interaction with nature really striking and fascinating, and definitely worth investigating.

Risk is really important because it raises a lot of questions both in relation to child-nature relationships and to childcare more broadly.

BF: It seems like LearningNatures is starting in the right place then—from the bottom up—which brings me to my last question for you regarding the potential outcomes of this project. Namely, what societal impacts are you hoping for, and to whom will you try to convey the findings of your research?

FM: Well, on the small scale for now, we hope to be able to offer to interested people here in Munich an “Open Day,” during which our team will present our research results and take time to listen to the concerns of parents, educators, teachers, and so on. I think that there is then the potential to generate further insights—for instance on environmental care—that could then be adopted by institutions such as schools or kindergartens. As I mentioned before, another aspect of this project looks at childcare practices, and I am also currently interested in how ideas about “optimal child development” inform early childhood interventions in the Global South. In [a paper I cowrote](#) together with colleagues, we argue that early childhood interventions in the Global South—by ignoring ethnographic evidence and basing their claims on developmental research undertaken almost exclusively in the Minority World (Europe and the US)—end up depicting childcare practices there as “deficient.” Our critique has already received a lot of attention from policymakers and colleagues in psychology. We are currently making an effort to be intelligible to different communities of experts.

BF: It sounds like you’re headed in the right direction. Thank you so much for your time, Francesca. I am sure this will be an exciting research project.

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RIVERS AS BATTLEFIELDS: UKRAINE'S DNIPRO

Paul Josephson

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Wars turn the natural environment into battlefields. In economic wars, regions perceived as rich in resources become contested bounty for powerful predators, investors, state authorities, and eventually settlers. Wars follow transportation routes along rivers that reflect power relations in the movement of settlers, emissaries, and troops. In pursuit of energy, agriculture, and state power—and not only the ends of war—rivers are often sites of violent environmental change when they are straightened, blocked, or drained. And in the worst circumstances, soldiers transform entire ecosystems into war machines, even to the extent of setting fire to forests and fields, blowing up factories and power stations, and pouring toxic chemicals and fuels into rivers to poison the waters.¹



Fig. 1. The destroyed Kakhovka Dam, Beryslav town, and Dnipro riverbank, dried-up after water level sharply dropped following the collapse of the dam, are seen from the town of Nova Kakhovka in Kherson region, Russian-controlled Ukraine, 5 July 2023. © picture alliance / REUTERS / Alexander Ermochenko. All rights reserved.

The Dnipro River, the fourth-longest river in Europe (after the Volga, Danube, and Ural), and the inhabitants of its basin have experienced such cruel hardships over the last century, most recently due to Russia's invasion of Ukraine. The Dnipro became the front between the Ukrainian and Russian armies, and its fate is now connected to the blowing up of the Kakhovka Dam along with the Hydroelectric Station (KGES), in Kherson region of Ukraine, in June 2023.² The explosion released water from an 18.2-cubic-kilometer reservoir from behind a 30-meter-tall dam. The torrent inundated cities, towns, and farmlands, and killed unknown scores of people downstream in the Kherson and Zaporizhzhia regions.

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At 2,200 kilometers in length, originating in Russia and flowing through Belarus and Ukraine to the Black Sea, and with a drainage basin of over five hundred thousand square kilometers, the Dnipro has rich cultural, economic, national—and environmental—meaning for Ukraine.³ It served the Amber Road trade route between the North, Baltic, and Mediterranean Seas in antiquity and was central to power plays between the Polish-Lithuanian Commonwealth and Russia from the time of Peter the Great. It was a major focus of Soviet efforts to transform the empire's rivers into "machines"—nexus of hydropower, irrigation, canal, transportation, and military systems in support of state power.⁴

Many observers in western Europe and the United States became aware of the environmental significance of the Dnipro River only after the 1986 Chernobyl disaster. The Pripjat River, the source of cooling water for Chernobyl's reactors, flows into the Dnipro and thence to Kyiv, only 90 kilometers away, and deposited radioactivity in sediments in and around Ukraine's capital city.⁵ But large-scale engineering projects that altered the Dnipro's ecology long predated Chernobyl's notoriety. They include the Bug-Dnipro Canal, first opened in the late eighteenth century and reconstructed several times up to the present. Engineers pursued other canal, impoundment, and power-plant projects involving the Dnipro, as they do on rivers everywhere in the name of flood control, power generation, and irrigation. In their calculations, they often underestimate the costs of construction, and they rarely take into full account the inundation of fertile farmland, the displacement of tens of thousands of local people, the destruction of churches, villages, cemeteries, and memories, and other significant socioenvironmental costs. Yet, flood control on the Dnipro was paramount, as there were nine major floods between 1789 and 1931, the last of them endangering some of the most densely settled areas of Kyiv.⁶



Fig. 2. The Dnipro River basin. [Wikimedia Commons](#). CC BY-SA 4.0.

The modern engineering assault on the Dnipro commenced with the Russian Revolution. As part of Vladimir Lenin's plan for the electrification of Russia (GOELRO, or State Commission for Electrification of Russia, 1918), the Bolsheviks set out to build the world's greatest hydropower stations. They believed that electricity provided a foundation on which to erect Communism. One of the most famous, and first, hydraulic schemes arose on the Dnipro at Zaporizhzhia after Lenin's death: the widely celebrated "Dniprostoi" (Dnipro Construction Project), planned in the 1920s and carried out in the early 1930s. Dniprostoi was an early Stalinist hero project that

focused the nation's labor and capital resources on waterworks. It sought to demonstrate what raw, peasant recruits could accomplish when forced by the Communist Party to achieve state-construction goals in short order; in this case, however, the government had to rely on technology and experts from the United States to bring the project to fruition.⁷

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World War II temporarily interrupted transformation projects on the USSR's river basins. But the state returned to its war on nature through Stalin's Great Plan for the Transformation of Nature (or Stalin Plan, 1948), a massive effort to control the major waterways of the European USSR—the Don, Dniro, and Volga Rivers; to create an extensive irrigation network to turn steppe into agricultural wonderland; and to plant seventy thousand kilometers of so-called forest-defense belts to protect farmlands from hot, dry winds.⁸ The Stalin Plan explicitly pointed to “capricious” nature as an enemy of socialism. No less than counterrevolutionaries and “wreckers,” nature would succumb to the harsh intervention of the Communist Party, which would force it to operate according to five-year production plans.⁹ Yet, the projects connected with the Stalin Plan led to the inundation of hundreds of villages and towns and the forced removal of tens of thousands of residents, and they required the use of hundreds of thousands of gulag prisoners, many of whom perished in harsh labor conditions.

The complete numbers of oustees from river engineering in the USSR—or along Ukraine's Dniro—are held in closed archives. The exact numbers of gulag prisoners at dam, canal, and other hydroconstruction sites, similarly, remain unknown. But two hundred thousand prisoners were used to build the Kuybyshev Hydroelectric Station (now Zhyguli Hydroelectric Station) alone in the early 1950s, and many of the other labor camps involved in hydraulic excavations held twenty to fifty thousand slave laborers. The USSR was not unique in pursuing projects so costly to local residents, prisoners, and nature. These kinds of hydraulic schemes often translated into high levels of state violence by the late twentieth century: in China, between one and a half and two million people were ousted for the Three Gorges Dam on the Yangtse River, and roughly the same number from three states—Gujarat, Maharashtra, and Madhya Pradesh—for waterworks on India's Narmada River. In all events, over the entire Soviet period, the discharge of the Volga River into the Caspian Sea was reduced by almost 70 percent; that of the Dniester, Dniro, and Don into the Black and Azov Seas by around 50 percent.¹⁰ Severe erosion plagued most dams, irrigation likely reached only one-third of the targets, fisheries were destroyed, and spawning areas eliminated. These were the costs of a war on nature undertaken under the Communist banner of improvements in transport, agriculture, and power production.

The Kakhovka Hydroelectric Station grew out of the Stalin Plan. The project included the construction of the Kakhovskyi and North Crimean Canals intended for irrigation in territory that was annexed and occupied by Russian invaders in 2014. In early December 1950, the first caravan of barges from Zaporizhzhia arrived at Kakhovka with construction materials and exuberant young workers. Within a year, some twenty thousand laborers were excavating, building cofferdams, dynamiting, and pouring concrete; they toiled in miserly, filthy conditions, and lived in temporary barracks, with long lines for bread, late pay, and few moments of leisure or rest.¹¹



Fig. 3. Soviet Union stamp depicting the Kakhovka Dam, 1951. [Wikimedia Commons](#). [Public domain](#).

By 1959, the power station reached its capacity of 350 megawatts. Electricians hung power lines to Crimea, Kherson, and Krivoy Rog; plumbers and pipelayers built pumping stations at Tsiurupynsk (now Oleshky), Vynohradiv, and Dudchany to support thousands of hectares of farmsteads through irrigation networks. In the fervor of Communist construction, the press was filled with articles about how the waterworks would enable transport from the Mediterranean Sea almost to Leningrad without going through the Strait of Gibraltar, how irrigation would turn steppe into lush gardens, beautiful orchards, and vineyards, and how dairy cattle and fine-fleece sheep would occupy verdant pastures while electric tractors would make collective farmers happy.¹² Ukrainians in Ukrainian SSR, Tadjiks in Tadjik SSR, Russians in the Russian SFSR—the Soviet masses all seem to have embraced the technological modernization promised in the Stalin Plan, as indicated in extensive celebratory coverage of projects in local, regional, and republican press. In essence, all of these hydraulic projects were intended to weaponize water, to subjugate it to state economic and military plans intended to ready socialist industry for the inevitable war with the capitalist world.

The Dnipro itself ultimately became a cog in the Soviet military industrial complex.

To fill the reservoir of the Kakhovka Dam, some 37,000 people had to be resettled from villages near the city of Kakhovka. The reservoir flooded the historical area of Velikiy Lug and ancient burial grounds in the floodplain of the Dnipro that had belonged to the Zaporozhian Cossacks until they were subjugated by Catherine the Great. In all, perhaps 90 settlements were submerged, along with 257,000 hectares of land. Many animals drowned, and others, such as wolves, were tracked down and shot.¹³ Troubled by the displacements, the Ukrainian writer and director Alexander Dovzhenko, who visited the construction site before the reservoir filled, dedicated a filmscript, *Poem about the Sea* (1958), to the memory of flooded villages. Literary and social opposition to the Soviet economic-development model appeared in Russia as well, for example in the work of writers of the village-prose genre, notably in Valentin Rasputin's *Farewell to Matyora* (1976), about the inundation of a community and its memories of simple life during the closing of a dam.¹⁴

The Dnipro itself ultimately became a cog in the Soviet military industrial complex: from the 1920s to the 1970s, workers built a cascade of six reservoirs and dams: Dnipro (1930s, 560 MW), Kakhovka (1950s, 350 MW), Kremenchuk (1950s, 700 MW), Kyiv (1960s, 440 MW), Dniprodzerzhynska (now the Middle Dnipro Hydroelectric Station, early 1960s, 350 MW), and Kaniv (1970s, 500 MW).¹⁵ The Kakhovka Reservoir, at 18.2 cubic kilometers, held a greater volume of water than the Kyiv, Kremenchuk, and Kaniv reservoirs combined.

Engineering megaprojects across the globe often move forward with promises of cheap kilowatts, nearly fail-safe flood control, and increases in agricultural production. They are inextricably tied to other technologies—transport, industry, electricity distribution, military enterprises, cooling, and fisheries—whose operation they alter and influence. They create jobs. But, unspoken, they clearly arise in response to their promoters' visions of enhancing the state's military might and preparedness. The authorities—and publics—tend to overlook the immense environmental degradation brought about by megaprojects such as the Stalin Plan because of their touted large-scale benefits. Unfortunately, construction efforts such as the KGES—and river basins such as the Dnipro's—also become sites of direct military operations and environmental devastation when they are weaponized in situations of conflict and war. A 1968 Soviet postage stamp leaves no doubt about the military meaning of dams for Soviet power (Figure 4).



Fig. 4. A 1968 postage stamp commemorating 50 years of the Soviet (Red) Army. Courtesy of the Russian postal service. Public domain.

In June 1941, the Nazi Wehrmacht invaded the USSR, rapidly overrunning the Ukrainian SSR and Belarusian SSR. Soon thereafter, Stalin, who had signed a treaty with Hitler to divide Eastern Europe in 1939, ordered the interior ministry of the Soviet Union (NKVD) to blow up dams and other industrial facilities in Ukraine (including the Dnipro Hydroelectric Station and its dam) ahead of the German advance, to deny access to power and fuel resources. The demolition of the dam led to flooding of villages and settlements along the Dnipro, killing thousands of unsuspecting civilians and Soviet troops. Some historians estimate the death toll at between twenty thousand and one hundred thousand. One survivor, Oleksiy Dotsenko, remembers that the Dnipro “turned red.” He recalled that “People were screaming for help. Cows were mooing, pigs were squealing. People were climbing on trees.” The authorities justified the human losses to protect the Motherland and to permit evacuations to proceed.¹⁶

After gaining its independence in 1991, Ukraine’s power industry sought to update and repair the Kakhovka Reservoir, replacing six turbines and increasing the power by 20 megawatts. The station was crucial to Ukraine’s future: its locks enabled navigation from Kherson to Zaporizhzhia, its reservoir cooled the Zaporizhzhia Nuclear Power Plant (with six one-thousand-megawatt reactors, the largest station in Europe—and currently also occupied by Russian soldiers), and its waters were critical to agriculture in southern Ukraine—and in Crimea. Ukrainian officials ordered a study already in the early 2000s about the potential of a full-scale disaster along the Dnipro if a dam were to fail after a terrorist attack.¹⁷

The water carried petrochemicals and urban waste downstream, creating dank, toxic, turbid swamps, littering the shores with bodies, livestock, and pets.

In early 2022, when Russia had amassed 180,000 troops on Ukraine's border, Ukrainian and Western observers still hoped that President Putin would not order an invasion. But on 24 February 2022, Russia attacked. Within a few days, the Zaporizhzhia Nuclear Power Plant fell into Russian hands. On 11 November 2022, Russian troops blew up sections of road and railroad at the Kakhovka dam. On 6 June 2023, as Ukraine began an offensive along sections of the Dnipro River, the dam was blown up as a tool of war. The reservoir poured out into towns and villages. The water carried petrochemicals and urban waste downstream, creating dank, toxic, turbid swamps, littering the shores with bodies, livestock, and pets. Fish gasped for air in mud flats. Art museums, schools, monuments to World War II (ostensibly important to Russian memory politics), archeological sites dating back two millennia, factories, agricultural regions, irrigation systems—all were destroyed.¹⁸ The destruction of the dam put the Zaporizhzhia Nuclear Power Plant at great risk because it depends on the Kakhovka Reservoir to cool its reactors. The demolition cut water supplies to Crimea, endangering Russia's annexed land. It threatens Ukraine's production of corn, wheat, sunflowers, barley, and a variety of seed oils. In all, 80 villages were submerged.¹⁹



Fig. 5. The city of Kherson after the explosion on the Kakhovka Dam. © Vladimir Smirnov on Adobe Stock. All rights reserved.

The KGES was an architectural monument to Stalinism, a key to Ukraine's energy independence and agricultural power, a heroic symbol of engineering hubris, a deepwater route from the Black Sea to Zaporizhzhia, and a place of homes, roads, power lines, and other communications that united the left and right banks of Ukraine's Dnipro before Russia's invasion.²⁰ When the war and occupation end, Ukraine will face serious questions about how and to what extent to rebuild KGES and other massive engineering projects that became battlegrounds along the Dnipro.

Notes

¹ On war and nature, see Simo Laakkonen, Richard P. Tucker, and Timo Vuorisalo, eds., *The Long Shadows:*

A Global Environmental History of the Second World War (Eugene: Oregon State University Press, 2017).

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MOTHER DRONE, MOTHER NATURE: THE GRIFFON VULTURE AND ISRAEL'S MILITARY

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Fig. 1. Israeli soldiers exercise in a desert. © Pavel Bernshtam on Adobe Stock. All rights reserved.

In July 2020, Israeli television reported on an endangered griffon vulture (*Gyps fulvus*) chick who had lost his mother to electricity wires. As would soon become clear, the chick's father was unable to provide enough food to ensure his son's survival. The Israeli army, referred to by most Israelis as the Israel Defense Forces (IDF for short, or *Tsahal* in Hebrew), readily stepped in, using a state-of-the-art drone technology to drop daily offerings of rat food for the chick by deftly managing the intense cliffs. "Mother drone," as the army referred to this technology, was blurred in the video that documented the operation. It had to be, the reporter explained, because it "belongs to the Israeli army and is classified as top secret." Standing with his back to the camera, the military general in command told the reporter about the countless hours spent practicing the delivery on a mock-up of the ledge and nest before the military started food drops for real. The report ended with the following statement: "The collaboration between a tech company, the military, and conservationists got the ultimate endorsement this week when the chick flew for the first time. Job [well] done!" (Figure 2).¹



Fig. 2. After his mother died by electrocution, an endangered vulture chick is fed by "Mother drone," an advanced technology operated by the Israeli army.

This three-minute news item encapsulates the three-way dance between conservation, digital technology, and the Israeli army. The blurred classified drone, the obscured military general, and the three men—from high tech, conservation, and the military—congratulating themselves on their mothering skills, all occurred at one of the most visited national parks in Palestine-Israel, Ein Avdat in the southern Naqab-Negev desert, and was broadcasted live to the Israeli public via a 24/7 camera installation. This was not the first, nor would it be the last, collaboration between Israeli conservationists and the army.

Relative to its size, Israel has the most extensive military control of land in the world.² Specifically, the Israeli army administers 50 percent of the country's state lands, which encompass 93 percent of the entire area "inside" the Green Line—the internationally recognized 1948 borders of Israel. Israel's military activities directly destroy ecosystems in the following ways: the army produces waste and pollutants—fuel, oils, hazardous materials, radiation, and noise; army tanks and all-terrain vehicles routinely trample over massive areas, including in nature reserves and national parks; many army bases are not connected to sewage treatment plants; military units will often cause wildfires during combat operations; and abandoned bases turn into refuse dumps.³ It is not too surprising, therefore, that the State Comptroller's 2019 Annual Report found that the Israeli army has had a harmful effect on the environment inside the Green Line. Its impact is even more pronounced beyond the Green Line in the occupied West Bank, which has been under Israeli military control since 1967. There, the large network of closed military zones is maintained and supported by an extensive infrastructure of roads, watchtowers, checkpoints, and security fences.⁴

As the single largest polluter in the country,⁵ the Israeli army is easily the number one enemy of the environment in Palestine-Israel. But closed military zones simultaneously protect habitats and ecosystems from human development. Such positive impacts of militarism on environmental protection have been acknowledged in the broader literature and are often referred to as "green militarism." While earlier studies in this field documented the ecological devastation wrought by military activities, especially in conflict zones and border areas,⁶ recent studies reveal a more complicated relationship between nature and the military. Several scholars have explored, specifically, how the creation of military buffer regions, training areas, and demilitarized zones led

to the protection of biodiversity by excluding other environmentally destructive activities such as commercial development.⁷ Within this scholarship, military zones that were transformed into wildlife protection areas have received special attention.⁸

In 2014, a partnership was forged between Israel's military and the country's central nature protection organizations, advancing dozens of mini-projects to save select species and habitats.

Some of the insights of this literature are highly relevant in the context of Palestine-Israel as well, although militarism and wildlife usually work here in tandem rather than in succession. Indeed, in addition to its control over vast tracts of open spaces, the Israeli army is increasingly committed to actively cleaning, restoring, monitoring, and protecting wildlife and habitat. In 2014, a partnership was forged between Israel's military and the country's central nature protection organizations, advancing dozens of mini-projects executed by specific army units to save select species and habitats. This partnership, referred to as the Nature Defense Forces (a play on the army's official name, the Israel Defense Forces), demonstrates the intensifying connection between Israeli militarism and the country's wildlife protection.

The question nonetheless remains: why would the Israeli army, which has major security concerns to contend with, be involved in nature protection to the minute details of caring for a single endangered vulture chick? The most obvious explanation is that this is a form of "greenwashing": an endorsement of environmental values as a cover for promoting other, usually harmful, impacts.⁹ The drone, a military technology designed to kill human enemies, is rebranded in this instance as a civil technology for saving endangered nonhuman chicks, thereby legitimizing its more sinister uses. Israel's emerging identity as a start-up nation—with its heavy reliance on advanced technologies, including for resource management and conservation—is often credited to the Israeli military's role as an incubator for such projects. The army is thus both an initiator of, and a client for, high-tech innovations. Either way, saving an endangered motherless chick is the best PR the Israeli army could hope for.

But while greenwashing is certainly a powerful explanation for the involvement of the Israeli military, as well as many other armies, in conservation, the military-nature nexus also runs much deeper than that: arguably, military and nature are coproduced and even symbiotic in their relationship. In Palestine-Israel, this coproduction proceeds in myriad ways: the practice of hiking and thereby knowing the land is popular among Jewish Israeli citizens of all ages who are simultaneously active or potential soldiers or veterans; intimate historical, cultural, and organizational ties exist between the Israeli army and the Israel Nature and Parks Authority; and, finally, ideas of connecting to and saving nature are promoted as an important part of the soldiers' personal and national identities.

The vulture is an impressively large raptor with a wingspan that can reach 10 feet. Her charismatic presence in the landscape makes the vulture "a good animal to think with" about settler colonialism and militarism, and about how both manifest in Palestine-Israel. Alongside the Persian fallow deer, the Asiatic wild ass, and the Arabian oryx, the griffon vulture is a biblical species chosen by Israeli conservationists for heightened management. The increased presence in the natural landscape of species that are identified with the Bible advances the mission of making the landscape holy again, supporting the idea that the real Indigenous people of this land are the Jews. This land was promised by God to them, it is implied, and not to the Palestinians.¹⁰

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The temporal leap from biblical to modern times has, however, sown confusion regarding the identity of the biblical bird. The word *neshar* appears 27 times in the Bible, where it clearly stands for vulture, according to experts. But the first translators of the Bible from Hebrew and Aramaic to Greek got it wrong and wrote *a'etos*, which is the Greek word for eagle. This mistranslation persisted well into the twentieth century. Reverend Henry Tristram, a British missionary and ornithologist who traveled to the region in the 1860s, suggested to put an end to this misnomer, asserting that the biblical *neshar* was not an eagle but a vulture. Tristram's stance was adopted by Israel Aharoni, a highly influential zoologist who worked in Palestine in the early twentieth century. Linguists opposed it, however, insisting on the already popular translation of *neshar* as eagle.

A rivalry between Israel's zoologists and its linguists thus ensued. In 1964, the Academy of the Hebrew Language was already split on this issue, and so the *Birds in Israel* dictionary was published without mentioning this bird, despite its centrality in the region. In 1973, tensions flared up again, and the Israel Zoological Society threatened to appeal to the Supreme Court. After a heated debate, the academy finally ruled, by a majority of one vote, in favor of *neshar* as a vulture.¹¹ Although this marked the end of the legal battle, the controversy continues: nearly 50 years after the ruling, the lay public (including myself, although I didn't dare admit it to my interlocutors) still confuses the two birds, to the dismay of the Israeli bird experts.

The debate over the naming of biblical and other species reflects the importance of flora and fauna in the production of rival identities, which are central for the broader ecological warfare that takes place here. It also highlights that, despite the strong secular identity of nature experts in Palestine-Israel, the Bible is nonetheless an important source and justification for nature protection, simultaneously legitimizing the Zionist connection to this particular territory.

During the 1980s, the number of vultures in the region shrunk by 95 percent: from thousands to only 70 breeding pairs. This dramatic decline was mainly caused by inadvertent electrocution, poisoning, and habitat loss. While vultures have a bad reputation amid lay persons for eating decaying carrion and bringing bad luck,¹² conservationists have long pointed to their ecological significance. And so, in the 1990s, Israel embarked on a complex captive breeding program for the vultures. The idea was to coax them into producing more eggs in the wild and then to rear the hatched chicks in captivity (Figure 3, left). Concerned about imprinting the birds in ways that would limit their release into the wild, the managers have been using puppets to feed these chicks. The captive birds are first taught to fly in special cages (Figure 3, right) and then released to bolster the declining wild population. This wildly ambitious conservation project, carried out by the Israel Nature and Parks Authority with the support of the Israeli army, has succeeded against all odds.



Fig. 3. (Left) A griffon vulture chick. © JIT on iStock. All rights reserved. (Right) Griffon vultures on top of their special training cage in the Carmel Mountains, Palestine-Israel. © Iruş Braverman. All rights reserved.

There are currently 220 vultures in Palestine-Israel. They are intensively managed using various forms of digital conservation. The chief ornithologist for Israel's Nature and Parks Authority told me accordingly: "I cannot think of any other animal on this planet with such high monitoring rates. We have about 80 percent monitored by GPS and 75 percent of the vultures are tagged, meaning we know their history and we also [genetically] sample each one."¹³ Through this digital monitoring, an enormous body of data is accumulated about the vulture's location, body temperature, and movement. Specifically, acceleration data that identifies movement is analyzed to extract nuanced information about vulture behavior. This type of study is situated within the field of movement ecology, which promotes an understanding of movement patterns and their role in various ecological and evolutionary processes. Such complex conservation projects necessitate engagement with computer science, paradoxically distancing biologists from the very sites and materialities of their research. The alienation that occurs with such conservation management by algorithm highlights that "digital data enables and encourages the automation of conservation decisions."¹⁴

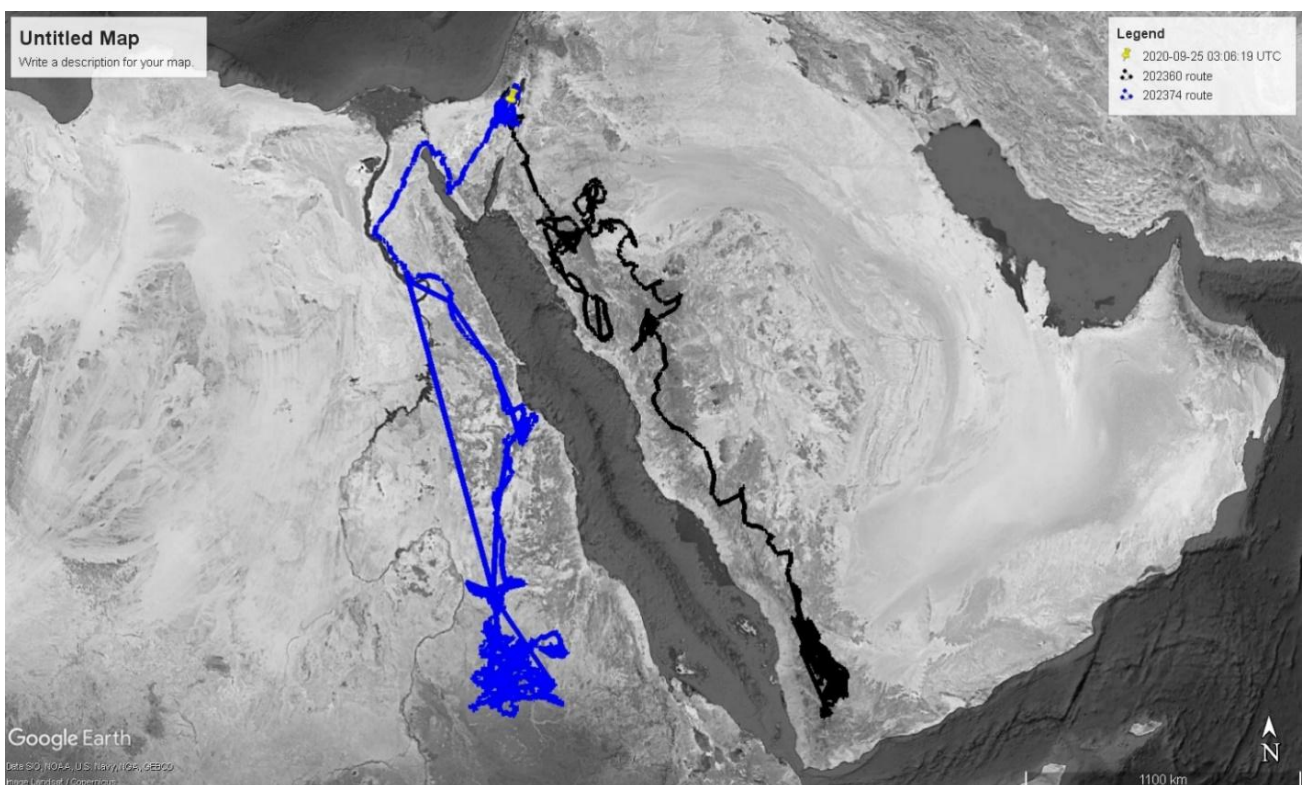


Fig. 4. A map of the long-range forays of two young griffon vultures. Orr Spiegel of Tel Aviv University explained that “these vultures were caught in southern Israel in 2020 as first/second year juveniles and fitted with GPS tracking devices. [They] dispersed south along the Red Sea, reaching around 2,000 kilometers from their home range in Israel. One flew along the western shore through Egypt and Sudan, the other on the eastern shore through Saudi Arabia and Yemen (March 2021). The vultures eventually return[ed] to their home range” (Email communication, March 2021). This data was collected as part of Nili Anglister’s dissertation in Orr Spiegel’s lab at the School of Zoology, Tel Aviv University, in collaboration with Noa Pinter Wollman from the University of California, Los Angeles, and Ohad Hatzofe from INPA. © Orr Spiegel. All rights reserved.

Still, and above all, managing birds is experienced by their experts as an act of intimacy and care. Moreover, such experts often comment that the love of birds has no flags, politics, or borders and that, consequently, bird conservation could also bridge borders to make peace in this region.¹⁵ Israel’s vulture conservation project certainly has no borders, stretching thousands of kilometers away from Israeli jurisdiction into northern Africa and Saudi Arabia (Figure 4).

Perhaps unsurprisingly, then, the slogan “birds know no borders” has been criticized by Israel’s neighboring countries as a green pretext for imperial control.¹⁶ These countries have therefore not always seen Israel’s intensive management of birds too favorably. In 2011, Saudi Arabia “detained” an Israeli vulture for spying. The vulture was carrying a GPS transmitter with the inscription “Tel Aviv University,” prompting rumors that she was a Mossad agent. Israeli conservation officials dismissed these claims as ludicrous Arab fantasies, implying that they know how to care for the birds in the region best.¹⁷ I refer to this perception of moral superiority in conservation management, which is often juxtaposed with a demeaning approach toward the native’s barbaric lack of care, as “ecological exceptionalism.” Alongside the remaking of the landscape after its biblical imaginary, ecological exceptionalism is yet another central tool for administering settler ecologies in Palestine-Israel. The role of bird protection for contemporary settler ecologies aligns with the broader significance that birds and their protection played in the early history of the modern Western conservation movement, which was mostly homogenous, white, and even racist.¹⁸

Alongside their important role for Israeli conservation, birds have also been central for Israel’s military. Over the years, the Israeli air force in particular has developed a totemic relationship with birds. It started by accident, so to speak. Israel occupied the vast Sinai desert region in 1967, using it for military training in both land and air. In 1982, it withdrew from the region as part of the peace agreement with Egypt, and its training areas thus shrunk considerably. The training now had to take place along the birds’ massive migration route between Europe, Africa, and Asia, where a half billion birds travel annually in what is often referred to as the world’s “eighth wonder.” In the following three decades, the Israeli Air Force lost 11 fighter jets as a result of bird collisions. Concerned about this massive loss in pilots and jets (but maybe less so in birds), the army approached Yossi Leshem, a prominent Israeli ornithologist, to map the birds’ migration routes. The solution was simple, Leshem told me. “We separate the sky between birds and aircrafts,” he said. “During the migration time, [which lasts] six months a year, the [pilots] don’t fly below 3,000 feet above ground level.”¹⁹ As a result of the new movement regime designed by Leshem, collision rates dropped by 76 percent. Soon after, Israel’s “take care we share the air” project became a model for air forces around the world. With the help of advanced technology and bird science, Israel thus transformed its spatial challenge into a military strength, packaged it as expert knowledge, and exported it as such to the militaries of neighboring countries.

Rather than recognizing and addressing the underlying problem—increased militarization—the technology merely mitigates the risks, at the same time enshrining military power in the region.

While preventing pilots and jets from crashing into birds (and vice versa) is a worthwhile goal, it is somewhat ironic that the collaborations between countries in this region have been directed toward further improving a military technology that would effectively enable them to continue flying their

war jets against each other, rather than eliminating the need to fill the sky with such jets in the first place. As in many other instances where technology is offered as a solution to problems caused by human encroachment, here, too, rather than recognizing and addressing the underlying problem—increased militarization—the technology merely mitigates the risks, at the same time enshrining military power in the region.

Whereas the army's initial study on birds emerged out of the pragmatic need to separate the sky, it would soon evolve into a much deeper engagement. Leshem explained that: "the army, at least in Israel, is the army of the nation. [It] is not just killing and shooting and fighting the enemy. If you want to have soldiers who protect the nation and understand why they are fighting, . . . you have to know its [nature]. It's the same as dating. To love someone, you have to know [them]. It's exactly the same."²⁰ The analogy between knowing the nation's land and wildlife and knowing a lover highlights the intimacies between nature, militarism, and the settler state.

The Zionist project of vulture conservation is therefore not only an environmental enterprise, nor is it solely about the land or even the animals and plants who dwell on it. It is, additionally, about the instrumentalization of nature to advance the Zionist mission: a way to strengthen the ties between the state, its land and creatures, and the Jewish soldiers who "serve" both the state and its nature. As for others in this region—mainly the Palestinians—they are typically barred from similarly serving the state and are therefore not exposed to, nor allowed to participate in, this intimate engagement with nature. At the same time, transboundary birds extend Israel's exceptional ecological reach even beyond its territory in an imperial form of conservation that is futuristic in its technological horizons yet also nostalgic in its harkening back to biblical imaginaries.

This article is adapted from chapter six in Braverman's book, *Settling Nature: The Conservation Regime in Palestine-Israel* (Minneapolis: University of Minnesota Press, 2023).

Notes

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¹⁹ Yossi Leshem (ornithologist), Skype interview by author, 3 November 2020.

²⁰ Leshem, Skype interview.

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HOME, ROOTS, COSMOS: A PATH THOROUGH CALVINO'S ECOLOGY

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The house is Villa Meridiana. You get there by going up a little side street that skirts Via Alessandro Volta, just outside the center of town. It's up high, on a steep slope overlooking the sea. All around are palm trees. Ahead, you find the cosmopolitan city of Sanremo, of the Hôtel des Anglais, of the casino that—in the time in which we find ourselves, the beginning of the 1900s—is one of the main attractions bringing visitors to the city. Behind it is another world.

You exit the little door onto a stone-paved mule path next to the *beudo*, a small canal, to find yourself in the countryside, where the languages spoken are no longer those of the tourists and the Italians that welcome them. They are other languages entirely: the guttural dialect of Ligurian peasants, the cracks and flutters of hunters, and the “absurd Latin of botanists”¹—the language in which Mario Calvino thinks his plants and through which he attempts to teach his children about them. More than languages, the main thing you hear are voices: the voices of the *gerbido*, the wild intermezzo between the forest and the agricultural borgo (village), and the voices of nonhuman animals—the birds and Mario's dog. And then there's the wind, which blows hard in this region.



Jean Mallard, *Expédition Végétal*. Pigment-inks print, 80 x 40 cm. Courtesy of the artist and La Slow Galerie. All rights reserved.

Roots. In Villa Meridiana, there are many. Most are underground, or tucked snugly inside large terracotta pots. Each plant has a name. Each plant is carefully catalogued, studied, observed—cared for. But this is the way it must be: we are in a floricultural experiment station, a botanical garden specifically for researchers. Other roots are not subterranean, though they are still tied to the earth: the roots of family that strengthen Italo's connection with this place and this landscape. They are Mario Calvino and Eva Mameli, and they are both scientists.

A path through Italo Calvino's ecology cannot help but begin here, with his house and his roots. Etymologically, “ecology” means to speak (*logos*) of the house (*oikos*). Ecology is also the science that sees life as a harmonic symphony, an uninterrupted communication—whether problematic, competitive, or collaborative—between everything that lives, evolves, and dies in a particular environment. This includes ideas, imagination, and fantasy; it includes the roots of the past

interwoven with the soil of the present. Italo Calvino's roots bind him to the soil of his familial home, of his personal ecology. Villa Meridiana is fundamental because it is home, because it is a garden, and because it nurtures the vegetal life of continents and their knowledges. Above all, it orients everything because it is, for Calvino, the very horizon of space and time. In his essay collection *The Road to San Giovanni* (1990), he writes that "a general explanation of the world and of history must first of all take into account the way our house was situated."²

The novel *The Baron in the Trees* (1957) is part of this ecology, this story of dwelling. It is the story of a boy, Cosimo Piovasco di Rondò, who leaves the ground to protest being given snails for dinner. He will spend the rest of his life in the trees and will experience all kinds of things there: love, adventures, hunting with his dachshund, reading books and studying, a gruff madness in his old age, and an ending where he disappears into the skies of the imaginary estate of Ombrosa aboard a hot-air balloon. It is his younger brother, Biagio, who tells us his story.

Much has been written about *The Baron in the Trees*, a wonderful novel for its inspiration, its linguistic richness, and the way the author, then only 34 years of age, manages to render historical, scientific, and philosophical complexity with a deft touch. The content is effervescent and unpredictable; it reads like a fable and can be interpreted in various ways: as Calvino's reaction to the ancien régime of the Italian Communist Party (PCI), which supported the USSR's violent response to Hungarian students demanding freedom; or as a utopia, expressed in the dream of a boy who refuses to set foot on earth and cultivates a radical political project that includes trees and other plants, domesticated and wild animals, and all humans. *The Baron* is all of this, but more too, especially when read through the lens of the environment.



Italo Calvino and his younger brother Floriano, June 1933. Courtesy of [Internet Culturale](#). CC BY-NC-SA 3.0 IT.

Calvino wrote the book in two and a half months, between 1956 and 1957, while also writing the short story "A Plunge into Real Estate," another "environmentalist" work, cautiously autobiographical, that discusses the destruction of the landscape of an unnamed Ligurian town (most likely Sanremo) at the hands of intellectuals and ex-partisans, land speculators of different varieties.³

The forest extends across the spine of the Alps, as if to embrace Europe in trees.

Although quite different, *The Baron in the Trees* and "A Plunge into Real Estate" are works that speak to one another. And they speak to a place, or of a place. They dialogue: one, *The Baron*, converses with the other, "A Plunge," from another time, from the Enlightenment and the era of Napoleon. It speaks from the heights of a forest that seems punctiform, located in the fictitious

Ombrosa, in the luxurious western Liguria (the Ponente). But the forest actually extends across the spine of the Alps, on this side and that, as if to embrace Europe in trees. And according to Calvino, it functions like an aerial highway—a world apart from the one below, one you could traverse from high in the branches. Set two centuries later, “A Plunge into Real Estate” listens from a changed earth. It listens from a ground where the surviving trees struggle to remain free in a landscape made of houses, condominiums, and construction zones that suffocate both the garden and the imagination.

What does *The Baron* say to “A Plunge into Real Estate”? In a certain sense, it tells its prehistory. It is a novel, as Calvino says, of “ancestors,” a chronicling that includes his other works: *The Cloven Viscount* (1952) and *The Nonexistent Knight* (1959). The ancestor in question in *The Baron* is Cosimo, who tells his descendants in 1957 about what the landscape used to look like. He also tells them of how they might interpret their humanity in a different way, not as terrestrial but as arboreal. He offers them an alternative genealogy, an alternative evolutionary branch—the path not taken. And he brings to light the interdependence (or the possibility of a biological, existential, and mental dialogue) between the human and vegetal worlds.

When *The Baron* begins, in 1767, most of the western Ligurian landscape was still covered in vegetation and trees. The aerial highway was in decline, but it was still present and full of vitality. Cosimo’s brother tells us this right away: Biagio recalls how he heard that once “a monkey that left Rome jumping from tree to tree could reach Spain without touching the ground.”⁴ By 1767, though, this was already changing. “The only place where the trees were so dense was the shoreline of the gulf of Ombrosa, from one end to the other, and its valley, up to the mountain ridges.”⁵ And these changes happened quickly. Biagio continues:

These places are no longer recognizable. First the French came, cutting down woods as if they were fields that are reaped every year and grow back. They didn’t grow back. It seemed a thing of the war, of Napoleon . . . but it didn’t stop. The hills are bare, so that to look at them, for us who knew them before, is disturbing.⁶

Biagio’s description of this universe of trees is impressively precise, and worth citing:

The only place where the vegetation was lower was the lemon groves, but in their midst rose twisted fig trees, which, higher up, obstructed the whole sky over the gardens with the cupolas of their dense foliage, and if not figs it was brown-leaved cherries, or the more tender quinces, peach, almond, and young pears, fruitful plums, and then service trees or carobs, when it wasn’t a mulberry or an ancient walnut. Where the gardens ended the olive grove began, silver-gray, a cloud with fraying edges. In the background was the town, stacked between the harbor below and the fortress above; and there, too, treetops sprouted everywhere amid the roofs: holm oaks, plane trees, even oaks . . . Above the olives the woods began. The pines must once have reigned over all the region, because they still infiltrated the slopes, in slivers and clumps, down to the shore of the sea, as did the larches. The oaks were denser and thicker than they seem today, because they were the first and most prized victims of the ax. Higher up, the pines gave way to chestnuts, the woods went up the mountain, and no limits could be seen.⁷

This is the world that disappears under “the fury of the ax” at the end of the novel, when the Restoration unfolds in Europe and Cosimo, now old and shabby, disappears into the sky attached to a hot-air balloon. That which remains on the ground is changed too: “no more the holm oaks, the elms, the oaks; now Africa, Australia, the Americas, the Indies extend branches and roots here,” the local fauna superseded by the imported.⁸

From the second half of the 1700s onward, the time in which Cosimo’s story unfolds, the rate of deforestation accelerated significantly across Italy. Forests were being cut down not just to fulfill the needs of the poor but also for the benefit of the rich. The forests became ever more implicated in the circuit of capital: lumber for ship production, construction, heating, and various industrial

uses. This all led to a profound and lasting modification of the landscape. In his book *Il bosco negli scrittori italiani del Settecento e dell'età napoleonica* (1947), geographer Bruno Vecchio writes of:

an acceleration . . . of the pace of deforestation, and a conspicuous extension of deforested areas: those that were cultivated, but also, increasingly, those completely abandoned to hydrogeological disruption. This happened either because they were targets of commercial capital and loans, or because they were left uncultivated after an ephemeral period of fertility, or because they were damaged by indiscriminate grazing by livestock.⁹

The Ligurian forests (both on the Ponente and the Levante) are no exception. The Genovese fleets sourced their lumber from here. When the fleets declined, though, the situation did not improve. An increase in farming, the need to build new roads to replace the old Roman roads, and the destruction of forests for immediate short-term gains (and without any system of penalties to stop the practice) all brought profound changes to the region. The results of these changes are visible in the washing away of the deforested landscapes, now more susceptible to hydrogeological risk, and, in damage that is the mirror opposite, the abandonment of the remaining forested areas.

Cosimo, though, is the knight who brings aid and makes alliances. He knows how to prune trees; he founds and maintains a mutual aid society to prevent and put out fires; and when he goes hunting and gathering with his dachshund Ottimo Massimo, he takes only what he truly needs. He knows these plants, after all, and by way of them, he gets to know the animals.¹⁰ Scholars have identified 58 plant species and 78 animal species in the book along with a series of technical terms, from “bugno” (log hive) and “talea” (cutting) to “inforcatura” (fork) and “capitozzare” (head-pruning).¹¹ Caring for and knowing trees is, for Cosimo, a radical, republican political project; it is the politics that he wishes for all living beings, regardless of gender, age, or, above all, species.¹²

Calvino, in short, shows that he is every bit the son of Eva Mameli and Mario Calvino, pioneers of international botany and plant science. He is too hard on himself when he confesses, in “The Road to San Giovanni,” “I could recognize not a single plant or bird. The world of things was mute for me.”¹³ In *The Baron*, nature speaks loudly through a cacophony of whistles, caws, moos, whimpers, and squeaks; it articulates itself in one enormous language: the language of the forest. This is a language Cosimo not only interprets but understands and practices.



Sanremo poster, c. 1920. Public domain.

Plants strategize, they join forces, collaborate, and organize.

The idea that forests think is, in fact, not so far-fetched. Plants are not only complex organisms but nodes in an underground communication network formed by the symbiotic links between roots and fungal mycorrhizae.¹⁴ Plants strategize, they join forces, collaborate, and organize. This is their way of thinking. The physical and philosophical relationship that Cosimo has with the forest is a conversation between different natures. It is defined by their reciprocal relationships, as scholars of biosemiotics, plant neurophysiology, and multispecies ethnography have long taught us. In this communication system, every tree—every blade of grass and every insect—is a self that has interests

and that carries information. This explains the solidarity that Cosimo—whose name means “world,” cosmos—shows with others. We must not forget that his decision to move into the trees because he refused to eat a plate of snails demonstrated a unique level of empathy toward the mollusks that his sadist sister, Battista, had been torturing.

In the end, Cosimo’s gesture is not just an act of juvenile insubordination or of refusal, it is also a return to the arboreal, to a previous stage of evolution in which hominids lived in trees to escape predators. It is perhaps also the dream of a different evolution, an alternative reality in which human beings never came down from the trees and instead developed their culture, thinking, and philosophy together with the forest. Cosimo, then, reawakens the Pleistocene in the trees of Ombrosa, a time when hunter-gatherers formed alliances with other species and the landscape was populated with stories. Humans became *narrative*.

Each reading of *The Baron in the Trees*, whether as a fable, a tongue-in-cheek historical novel, or an allegory for communism, is justifiable. But in the wild efflorescence of his imagination, Calvino’s landscape, created around this allegory—and encompassing these many possible interpretations—also documents a dynamic, historical, and ecologically accurate environment. Calvino is a humanist, but he is also deeply skeptical of the supposed centrality and superiority of the human, and he attempts to imagine an alternative humanity with the branches and genealogies of a different possible evolution. But the evolutionary path taken by Ombrosa was clearly following another direction, and Calvino saw that.

Today, Cosimo’s roots are covered in cement; and Ombrosa is no more. There is no longer a road to San Giovanni. Behind Villa Meridiana, the *beudo* and the mule path are now nothing more than a few bricks, lost beneath an avalanche of building speculation. To get to San Giovanni, you have to pass between tenements and paved roads, keeping one eye peeled for cars speeding around blind corners. Suddenly, a few hundred meters after a one-way street, the river, the little bridge, and the farmhouse appear. There are no longer diverse vegetable gardens but rather drab, green monocultures to be sold for floral arrangements—the decorative grass that they put around the edges of bouquets. Above, the Torino-Ventimiglia highway’s viaduct is crowded with stopped trucks because of another transit strike underway. Other highways, no longer of sap or leaves but of asphalt and cement, pockmark the landscape. A tacit reminder to the passing traveler: the Anthropocene has arrived here too.

Notes

¹ Italo Calvino, *The Road to San Giovanni*, translated by Tim Parks (New York: Pantheon Books, 1993), 7.

² *Ibid.*, 3.

³ Italo Calvino, “A Plunge into Real Estate,” translated by D.S. Carne-Ross, in *Difficult Loves*, 161–250 (London: Pan Books Ltd, 1985).

⁴ Italo Calvino, *The Baron in the Trees*, translated by Ann Goldstein (Boston: Mariner Books, 2017), 4.

⁵ *Ibid.*, 4.

⁶ *Ibid.*, 4.

⁷ *Ibid.*, 4–5.

⁸ *Ibid.*, 306.

⁹ Bruno Vecchio, *Il bosco negli scrittori italiani del Settecento e dell’età napoleonica* (Turin: Einaudi, 1974), 5.

¹⁰ Claudia Dellacasa, “La lingua degli alberi,” in “E io non scenderò più!” *Il barone rampante di Italo Calvino, 1767–2017*, eds. Mario Barenghi, Claudia Dellacasa, Laura Di Nicola, Bruno Falchetto, and Giacomo Raccis, special issue, *Bollettino di italianistica* 16, no. 1 (2019): 127–39.

¹¹ Dellacasa, “La lingua degli alberi,” 127–39.

¹² The idea has once again become current through the work of plant neurobiologist Stefano Mancuso, whose *La Nazione delle piante* proposes a “declaration of rights” for the vegetal world. Mancuso, *La nazione delle piante* (Rome: Laterza, 2019).

¹³ Calvino, *The Road to San Giovanni*, 11–12.

¹⁴ See, for example, Emanuele Coccia, *The Life of Plants: A Metaphysics of Mixture* (London: Polity Press, 2018); Monica Gagliano, John C. Ryan, and Patricia Vieira, eds., *The Language of Plants: Science, Philosophy, Literature* (Minneapolis: University of Minnesota Press, 2017); Stefano Mancuso and Alessandra Viola, *Brilliant Green: The Surprising History and Science of Plant Intelligence* (New York: Island Press, 2015); Michael Marder, *Plant-Thinking: A Philosophy of Vegetal Life* (New York: Columbia University Press, 2013).

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YORUBA ARCHITECTURAL SITES IN NIGERIA

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Heritage preservation is the strategy of conserving the cultural and environmental history of a certain time and place, and it also has political, spiritual, socioeconomic, scientific, and educational significance. The resulting heritage sites exhibit the past in the present; they are preserved with the hope of shaping an ecological future. As physical and cultural heritage, architectural sites represent the accumulated myths and worldviews of the people who acted on and transformed the land over long periods of time. Examining the aesthetics and philosophy that shaped three of the most important architectural sites of the Yoruba people in southwest Nigeria unveils the various facets and values of Yoruba heritage as it pertains to conservation and environmental protection. Some of the most significant Yoruba architectural sites are located in vast, hilly areas of primary forest in southwest Nigeria. The setting, design, and cultural meaning of these heritage sites signify hope for a harmonious coexistence between society and the nonhuman world (as for example shown in figure 1), while also foregrounding the vulnerability of the environment.¹



Fig. 1. The first Osogbo Palace, Osun Grove, Osogbo, Nigeria. © 2000 Gerhard Merzeder. Courtesy of Adunni Olorisha Trust-Adunni Osun Foundation. All rights reserved.

The Yoruba are a large ethno-linguistic group, with more than 50 million people in the Yoruba homeland, which incorporates parts of modern-day Nigeria, Benin Republic, and Togo. They are one of the largest ethnic groups in Nigeria. Their worldviews and relationship with the environment and the physical world are informed by two realms—the heavenly celestial realm (*Orun*), which is invisible or metaphysical, and the earthly terrestrial realm (*Aye*), which is visible and physical. The disembodied heavenly beings (invisible spirits) of the metaphysical *Orun* are embodied in earthly elements—the physical *Aye*—of the nonhuman world (trees, rivers, hills, forests) at their architectural sites. The natural environment thus plays a unique role in the Yoruba cosmological worldview.²



Fig. 2. The main entrance of Oduduwa Grove, Ile-Ife, Nigeria. Photo by Joseph A. Adedeji. [CC BY-NC 4.0](#).

Oduduwa Grove, or Oduduwa World Temple, (figure 2) is an urban forest in the heart of the city Ile-Ife. The site is divided into two sections that are separated by a masonry-fence wall: a constructed, semi-public section and a forested private section. The former contains residential buildings for the Oduduwa priest (the Obadio, who also doubles as the head of all other traditional priests in Ile-Ife and, by extension, Yorubaland at large), his family members, and guests, the graves of several past priests, a general courtyard, a courtyard for women (since the grounds are divided based on sex), and temples and shrines dedicated to Yoruba idols. The forested private section hosts the Oduduwa mausoleum, which is only accessible to the Obadio. One of the most significant works of architecture in the constructed section is the palace-reception building (figure 3) for the Obadio.

The palace is built of cement-plastered walls and has a zinc roof like all the other buildings in the compound, which are interspersed with trees that operate as shrines, as visible in figure 3 (left). Since the advent of Yoruba modern architecture, these industrially produced materials are used as replacement for earlier mud walls and grass-thatched roofs. Successive Oduduwa priests who have occupied the palace have conserved and renovated it according to the building technology available at the time. There are shrines in some of the other buildings, which are used—along with the Oduduwa tomb, located in the forested section of the site—for the initiation and ritual ceremonies (administered by Oduduwa priests) that precede the royal coronation of any new Ooni. Ooni is the traditional title of the King of Ile-Ife, whose palace is in another location within this core area of Ile-Ife. The Ooni is the most important traditional ruler of the Yoruba people in the homeland and across the diaspora.



Fig. 3. (Left) Oduduwa Grove Palace Reception, Ile-Ife, Nigeria. (Right) The hierarchical seating of traditional priests of Ile-Ife in the reception. This is a sociocultural foyer space that is characteristic of Yoruba traditional palace architecture. The hierarchical seating portrays the hierarchies of the gods and ancestral spirits that each priest represents. Photos by Joseph A. Adedeji. [CC BY-NC 4.0](#).

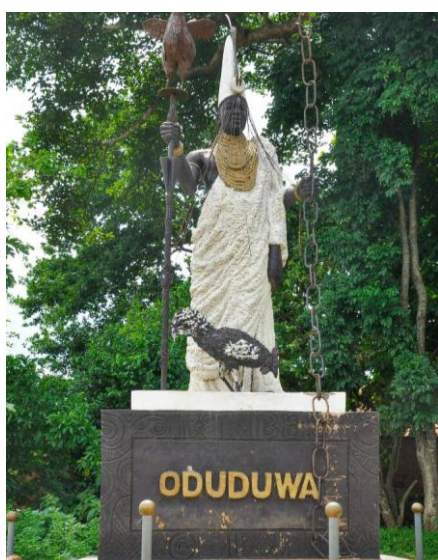


Fig. 4. The statue of Oduduwa at Oduduwa Grove, Ile-Ife, Nigeria. The chicken in front of Oduduwa is part of the royal staff of Oduduwa, which is believed to assist the god in the mythological creation story. Photo by The_AyeniPaul, 2017. [Wikimedia Commons](#). [CC BY-SA 4.0 International](#).

The statue in figure 4 symbolizes the myths of a Yoruba creation story in which *Olodumare* (the Supreme God), from the heavenly celestial realm (*Orun*), sent Oduduwa as a messenger to create the world at Ile-Ife. According to Yoruba myth—a significant part of the Yoruba worldview that shapes its traditional religions and their associated cult systems—the human figure depicts the embodied spirit of Oduduwa, who is believed to have descended from *Orun* with the aid of a chain at *Oramfe* (another sacred landscape in Ile-Ife). A chicken, believed to have descended from *Orun* together with Oduduwa, is said to have spread a piece of soil—thrown from the celestial realm into the existing earthly waters—until it expanded enough to become the entire terrestrial world. For this reason, the Yoruba believe Ile-Ife, a medium-sized city-state with a human population of 409,274 (2023), is the location of the first Yoruba civilization, settled around 500 BCE, and civilization in general.³

Just as it is rich in religious and mythological history, Oduduwa Grove is also rich in urban biodiversity, constituting a unique intersection of culture, myth, heritage, and nature. Its flora and fauna offer essential ecosystem services to the microclimate of the city. The tropical rainforest at the site—and its characteristic dense foliage system—acts as carbon sink and air purifier, while also providing a cooling effect to heat islands in the city. The urban conservation site thus affords an ecological balance

between the human and nonhuman worlds of the city.⁴ Being at the core of the city of Ile-Ife, the site also prevents soil erosion via the aid of the plants' root systems.

Fifty kilometers north of Oduduwa Grove is one of the two UNESCO World Heritage Sites in Nigeria: Osun Grove. Osun Grove is a significant Yoruba architectural site located at the edge of the core of another Yoruba city, Osogbo, which was founded around 1801 by two hunters named Laroooye and Oguntimehin. The site conserves a level of rainforest vegetation that documents both the tangible, architectural heritage of Yoruba city-planning—one which incorporates mystic forests or groves—and the intangible, cultural heritage of traditional religious and social principles.



Fig. 5. (Left) Visitors' Reception Center of the Osun Grove UNESCO World Heritage Site, Osogbo, Nigeria. (Center) The first Osogbo palace. Photos by Joseph A. Adedeji. [CC BY-NC 4.0](#). (Right) The second palace (now Ogboni cult house) at Osun Grove UNESCO World Heritage Site, Osogbo, Nigeria. © 2013 Julius Berger Plc. Courtesy of Adunni Olorisha Trust-Adunni Osun Foundation. All rights reserved.

Among the architectural structures of the site are the Visitors' Reception Centre and the first and second palaces of Osogbo (figure 5), which are religious symbols of the Osun and Ogboni cult systems and contain shrines dedicated to the corresponding gods. The structures can be viewed as works of art in architectural form. Their walls are made of earthen materials and covered with high-relief murals, while their roofs are made of timber and zinc. The earthen materials may have been sourced from the Grove, as is a common practice in Yoruba traditional building construction techniques. Such materials are amenable to the production of artistic high reliefs on the walls, are environmentally sustainable, and offer indoor thermal comfort. The timber and zinc are modern building construction materials that are readily available in Osogbo. The conservation of the site was achieved before the inclusion of the Grove to the UNESCO list of World Heritage Sites in 2005, in large part due to Austrian environmental activist Susanne Wenger (1915-2009), who was herself initiated into the Obatala (the Yoruba god of creation) cult, and also became a devotee of the goddess Osun.⁵ The sculptural designs of the structures—including the anthropomorphic aesthetics of the structural carved wooden caryatids (figure 6)—and the fact they are made of environmentally sustainable materials (earth and timber) allow them to organically blend into the surrounding forest landscape. This ecological milieu is highly biodiverse, with over 400 species from 63 families—including seven species of primates (e.g., *Cercopithecus* species) and reptiles (e.g., *Python* species)—and a rich variety of vegetation.⁶



Fig. 6. Structural wooden caryatids at Osun Grove. Photo by Joseph A. Adedeji. [CC BY-NC 4.0](#).

Not at least because of its rich biodiversity, Osun Grove is also a popular ecotourism site, comprising 75 hectares of primary rain forest with a 47-hectare buffer zone on the outskirts of Osogbo.⁷ This affords regular encounters between tourists and free-ranging primates, who often gather in large numbers if lured with biscuits, sweets, or bananas. Such scenes enrich the experience of visitors, especially children who are thrilled by the sight of primates peeling bananas. The annual Osun Osogbo Festival, usually celebrated every August, attracts visitors from regions of the world where Yoruba traditional religions still exist as the cross-cultural footprints of the slave trade, including Brazil, Cuba, Trinidad and Tobago, and North America.



Fig. 7. Mona monkeys (*Cercopithecus mona*) at Osun Grove. © 2019 CyArk. Courtesy of Adunni Olorisha Trust-Adunni Osun Foundation. All rights reserved.

Despite this enormous influx of tourism to the site, its environmental protection is ensured through privacy zoning, the establishment of tourist-specific walking routes, and the employment of tour guides. The preservation of the Grove is also assisted by various other actors: a full-time team of government officials from the National Commission for Museums and Monuments, which manages the site; local community members, who are largely devotees of Yoruba traditional religions; legal frameworks, which consist of laws of Osogbo Local Government, Osun State, and the Nigerian Government; and UNESCO. The local community members also cherish and welcome visitors since they act as salespeople, proud to market the Grove as their local resource and harness its economic benefits.



Fig. 8. River Osun at Osun Grove UNESCO World Heritage Site, Osogbo, Nigeria. Photos by Joseph A. Adedeji. [CC BY-NC 4.0](#).

Osun River (figure 8) meanders through the Grove and hosts along its bank numerous shrines dedicated to various Yoruba gods, creating a harmonious combination of forested landscape, waterscape, and religious architectural structures. The river originates in Igede Ekiti in Ekiti State, part of Yorubaland, and passes through Ijesaland before reaching Osogbo. It then flows out of Osun State to Oyo State and empties into the Atlantic Ocean. Devotees of the goddess Osun believe that she resides in the river and worship her at shrines along the riverbank and on the river itself.

At Osun Grove, the natural environment blends with the animistic sculptures of the shrines that dot its open spaces and appear under some trees. The trees are not planted (not ex situ) but are rather in situ, part of the primary nature; they are believed to be inhabited by invisible spirits, gods, or demons from the celestial realm. The Yoruba taboo system signifies a belief that whoever attempts to cut the trees would be attacked by the invisible entities that dwell there, while whoever harvests fish would suffer from a swollen stomach and the fish would never get cooked. This taboo system is specific to Osun Grove, but similar versions have served as traditional environmental conservation strategies for other sacred architectural sites in Yorubaland.

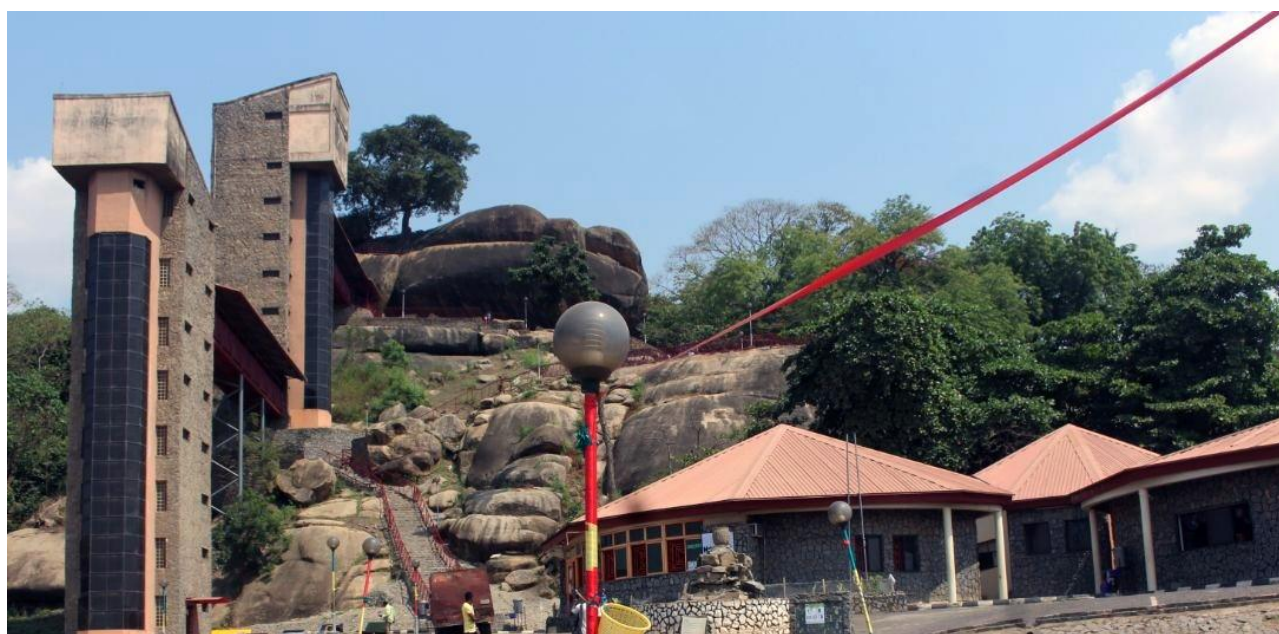


Fig. 9. A general view of Olumo Rock, Abeokuta, Nigeria. Photo by Joseph A. Adedeji. [CC BY-NC 4.0](#).

About 200 kilometers southwest of Osun Grove, in the city of Abeokuta—whose Indigenous inhabitants are of Egba and Owu Yoruba origins—is Olumo Rock, a hilly cultural-architectural site 137 meters above sea level. It is an urban landscape that documents the Egba-Dahomy war between 1843 and 1851, and the Owu-Ife war between 1821 and 1828. During these two intertribal Yoruba wars, Olumo Rock (figure 10, left) offered the Egba people refuge. The Owu and Egba peoples believe that the Rock is inhabited by a protective spirit who gave them refuge from their opponents and helped them win the wars. This protective role of the Rock and its caves demonstrates how social events and ecological places are often entangled in environmental history.

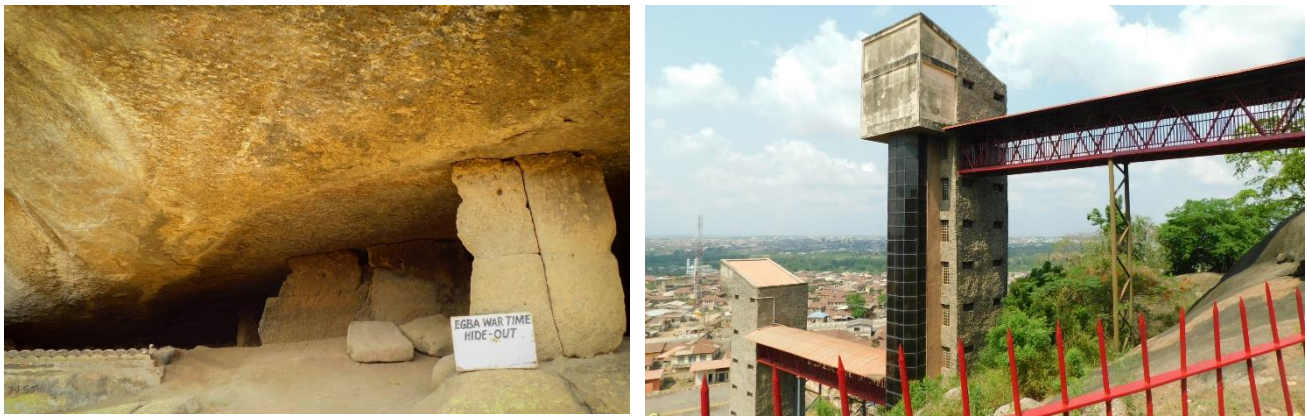


Fig. 10. (Left) Olumo Rock. (Right) Olumo Rock, lift house, and view of Abeokuta city. Photos by Joseph A. Adedeji. [CC BY-NC 4.0](#).

By 2006, Olumo Rock's major architectural component had been constructed: a mechanical lift (figure 10, right) to easily reach the Rock's topmost point. The lift house consists of vertical and horizontal circulation spaces, two lift shafts covered with glass, lift halls of stone walls, top-located lift-engine rooms, and metal bridges roofed with long-span aluminum sheets on a steel-roof framework. While the stone walls of the lift halls blend with the environmental aesthetics of the rocky site and are environmentally sustainable, the glass cladding of the lift is disruptive of this organic aesthetic appeal. At its highest altitude, Olumo Rock provides views of Abeokuta city. Other architectural components constructed on the Olumo Rock site include a museum, a multipurpose hall, Lisabi garden, a restaurant, a gift shop, and a water fountain. Artificial steps were also constructed for visitors who prefer not to use the lift. The vegetation of the site, the curvilinear architectural form of the structures, and the use of granite stone walls allows it to blend in with the rocky landscape and generate a sustainable organic architecture.

The site, especially the Lisabi Garden section (figure 11), holds a rich diversity of plants that are used in the preparation of traditional medicines. These include trees like Neem (*Azadirachta indica*), Baobab (*Adansonia malvaceae*), and Flamboyant (*Delonix regia*). The garden is a memorial of the Egba legendary warrior, Lisabi, who led the earliest settlers in the series of wars that ended around 1830.

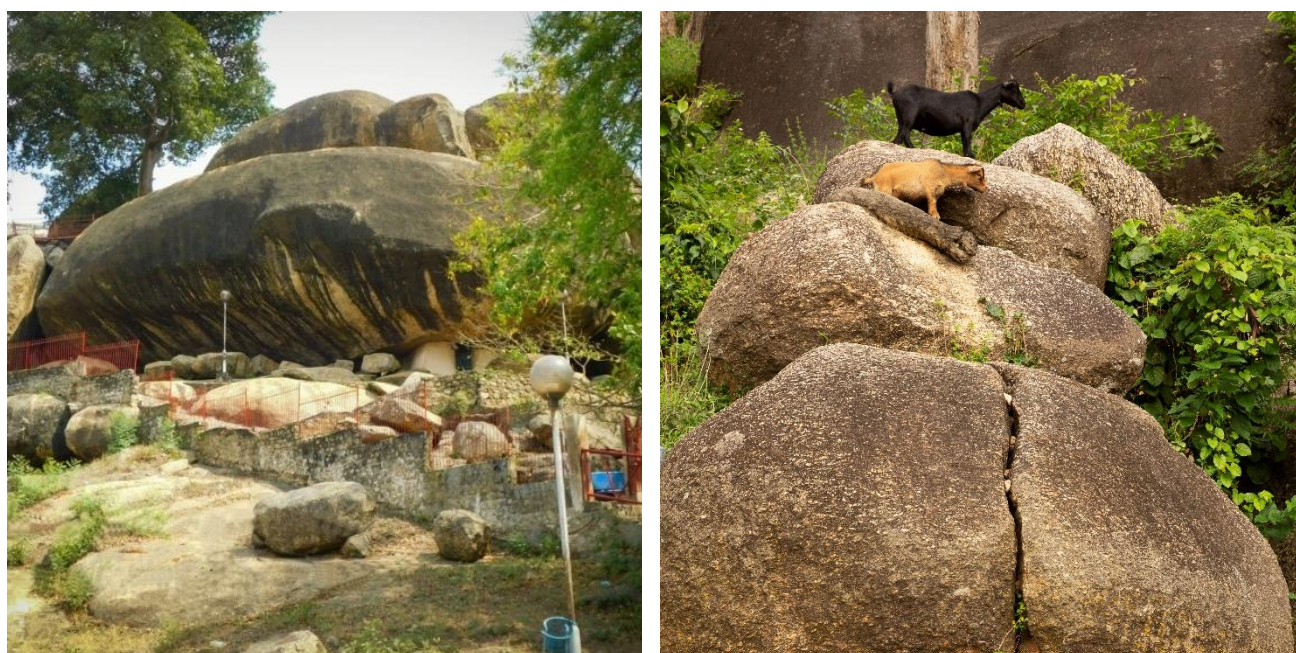


Fig. 11. Lisabi Garden at Olumo Rocks, Abeokuta, Nigeria. Photo by Joseph A. Adedeji. CC BY-NC 4.0. (Left) West African dwarf goats on Olumo Rock. © Fela Sanu on iStock. All rights reserved.

These three sites—Oduduwa Grove, Osun Grove, and Olumo Rock—demonstrate the power of architecture as a cultural agent with the capacity to transform and cooperate with natural spaces. The ecological locations are rife with symbolism, and bear numerous traditional identifiers of the Yoruba. They are natural milieus that are shaped by cultural practices, exemplifying how space is entangled with life and the afterlife. With the global institutionalization of cultural heritage, these sites will continue to be central to discourses on Yoruba environmental history, urban ecotourism in Nigeria, and the transportation of Yoruba Indigenous knowledge around the world.⁸

Notes

¹ See, for example, Dolly Jørgensen, *Recovering Lost Species in the Modern Age: Histories of Longing and Belonging* (Cambridge and London: MIT Press, 2019); Cornelius Holtorf and Anders Högberg, eds., *Cultural Heritage and the Future* (Oxon and New York: Routledge, 2020); Ngozi Ezenagu, "Heritage Resources as a Driver for Cultural Tourism in Nigeria," *Cogent Arts & Humanities* 7, no. 1 (2020): 1734331, <https://doi.org/10.1080/23311983.2020.1734331>.

² Joseph A. Fadamiro and Joseph A. Adedeji, "Cultural Landscapes of the Yoruba of South-Western Nigeria Demystified as Solidified Time in Space," *Space and Culture* 19, no. 1 (2016): 15–30, <https://doi.org/10.1177/1206331215595751>; Joseph A. Adedeji, "Sacralising Landscapes, Constructing 'Nature' at Osun Grove, Osogbo, Nigeria," in "Thinking with Urban Natures," *Global Environment* 16, no. 2 (2023): 19–198, <https://doi.org/10.3197/ge.2023.160202>.

³ For more information on oral-history accounts of the creation of Ile-Ife, see, for example, Olakunle Michael Folami and Taiwo Akanbi Olaiya, "Gender, Storytelling and Peace Construction in a Divided Society: A Case Study of the Ife/Modakeke Conflict," *Cogent Social Sciences*, no. 2 (2016): 1159015, <https://doi.org/10.1080/23311886.2016.1159015>; or Judith Bachmann, "Materialization through Global Comparisons: The Findings at Ile-Ife from the Late 19th Century to the 1960s," *Interdisciplinary Journal for Religion and Transformation in Contemporary Society* (2023): 1–25, <https://doi.org/10.30965/23642807-bja10086>.

⁴ Fadamiro and Adedeji, "Cultural Landscapes of the Yoruba of South-Western Nigeria Demystified as Solidified Time in Space"; Adedeji, "Sacralising Landscapes, Constructing 'Nature' at Osun Grove, Osogbo, Nigeria."

⁵ Peter Probst, "Yoruba Heritage as Project: Reauthenticating the Osun Grove in Osogbo, Nigeria," *African Arts* 42, no. 4 (2009): 24-37, <https://doi.org/10.1162/afar.2009.42.4.24>.

⁶ Thierry Joffroy and O. J. Eboreime, "Nomination to the World Heritage List, Osun-Osogbo Sacred Grove," (PhD diss., The Government of the Federal Republic of Nigeria National Commission for Museums and Monuments Abuja, 2004).

⁷ Godwin E. Oseghale, Emmanuel O. Omisore, and J. Taiwo, "Exploratory Survey on the Maintenance of Osun-Osogbo Sacred Grove, Nigeria," *African Journal of Hospitality, Tourism and Leisure* 3, no. 2 (2014): 1-22.

⁸ Joseph A. Adedeji, "Urban Biocultural Identity of Yorubas: Intersection of Philosophy and Nature for Wellbeing at Osun Sacred Grove UNESCO Site, Osogbo, Nigeria," in *Urban Nature: Enriching Belonging, Wellbeing and Bioculture*, eds. Charlie M. Shackleton and Michelle L. Cocks, 51-66 (London: Routledge, 2020); Joseph A. Adedeji and Joseph A. Fadamiro, "Urbanisation Forces on the Landscapes and the Changing Value-Systems of Osun Sacred Grove UNESCO Site, Osogbo, Nigeria," *Landscape Research* 43, no. 6 (2018): 798-816, <https://doi.org/10.1080/01426397.2018.1459525>.

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CRUDE ENCOUNTERS

Amelia Fiske and Jonas Fischer

Springs
The Rachel Carson Center Review

4 • 2023

Amelia Fiske and Jonas Fischer

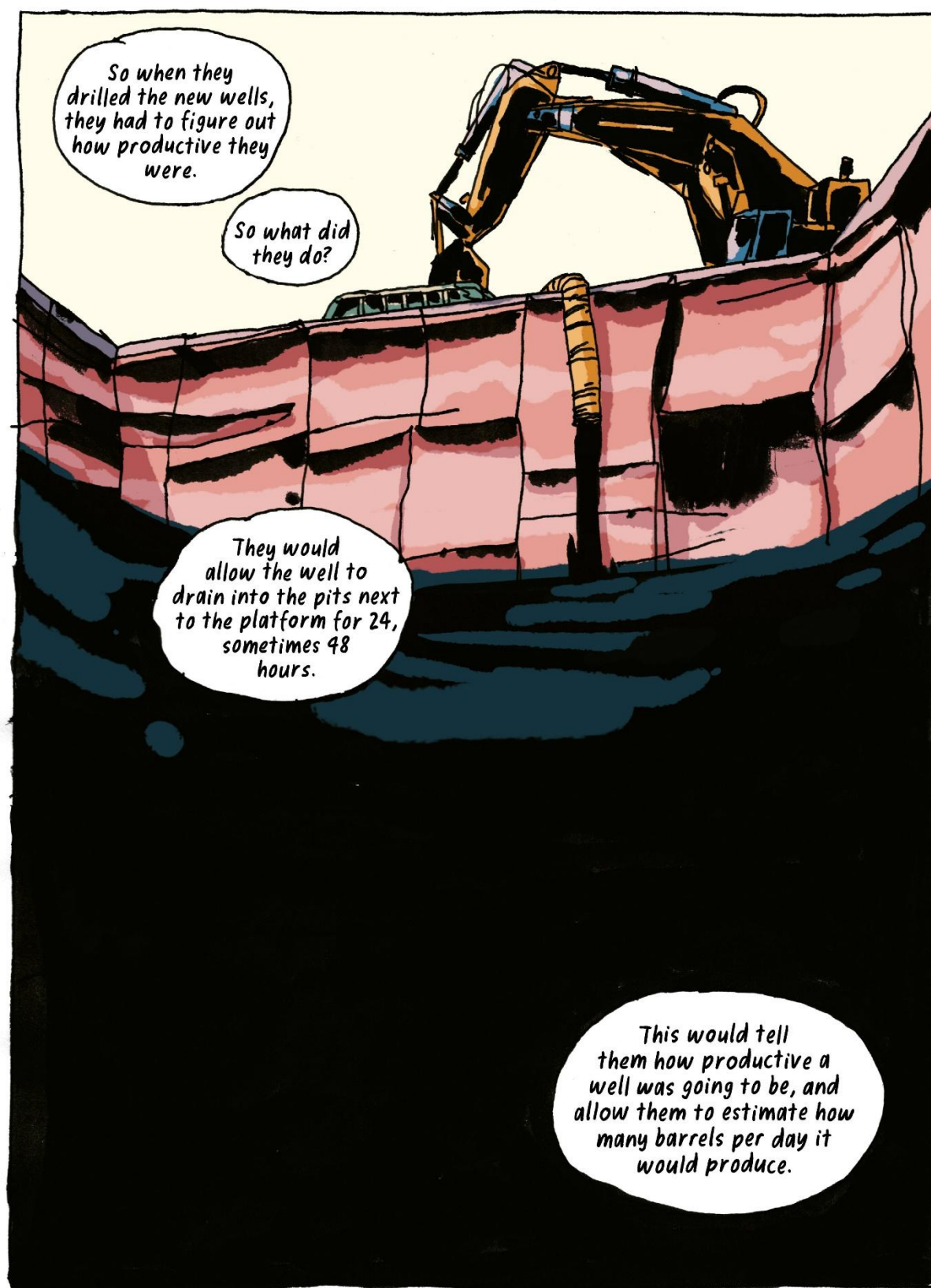
Encountering crude oil out of place: Wind your way through the forest, grasses skimming against your legs, the chatter of squirrel monkeys above your head, to come upon a swimming pool-sized pit of old crude leftover from oil extraction decades ago. Covered in plants and debris, vines from the trees reach down to brush the surface of oil that has lost its luster. Take a step out onto fallen logs and branches—a wobbly ledge to stand on—and you gaze at the waste pit. The guide slowly submerges a long branch. It moves downward until it hits the ground, one, two, sometimes three meters below, indicating the depth of hydrocarbon waste held in the pit. Donning a latex glove, you reach forward to touch the oil brought up from the bottom of the pit. Black and incandescent, it glints in the light. Squish it between your fingers, smell it, contemplating the interconnections of the substance—the transformation of the remains of organisms from a different epoch, the way it fueled your own arrival at this very pit, its sociopolitical reverberations throughout the region.



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Over the past decade, hundreds of people from outside the Ecuadorian Amazon have come to know about contamination in the region through “toxic tours,” in which a guide—usually local environmental activist Donald Moncayo—takes participants to contaminated sites. Toxic tours in the Amazon have been closely aligned with the plaintiffs in the longstanding *Aguinda v. Texaco* lawsuit and often include opportunities to meet with locals who offer firsthand experiences of contamination and struggles for justice.

Donald's toxic tours convince through personal and anecdotal knowledge. He weaves stories of everyday encounters with contamination together with a critique of the relations between power, pollution, and justice. He highlights not only the enduring presence of contamination in waste pits and streams but also the ways toxicants travel: the waterways that carry them, from streams to rivers; the families that live in the surrounding area; the agricultural products grown in contaminated Amazonian soil for national and international markets. Toxic tours are a sensory engagement with contamination, encouraging participants to contemplate their position in relation to oil production and consumption, from the cellphone in their pockets to the airplane fuel that allows many of them to get to the Amazon in the first place.



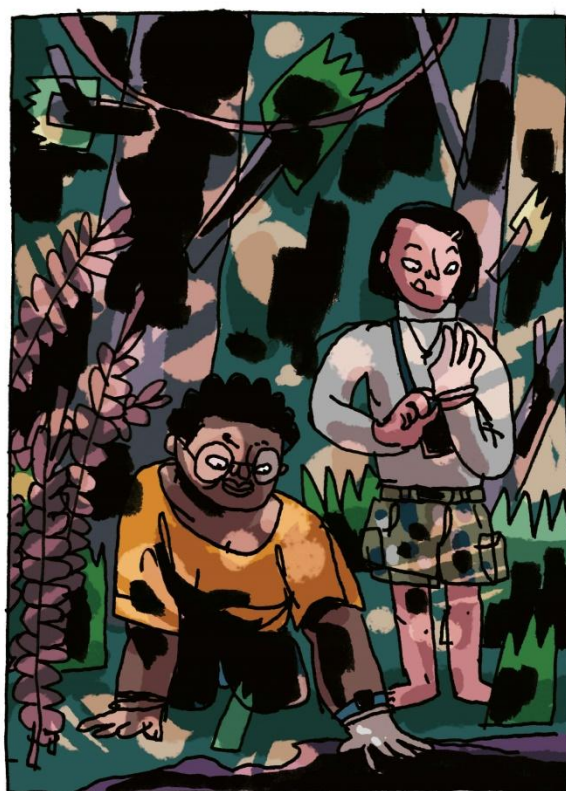




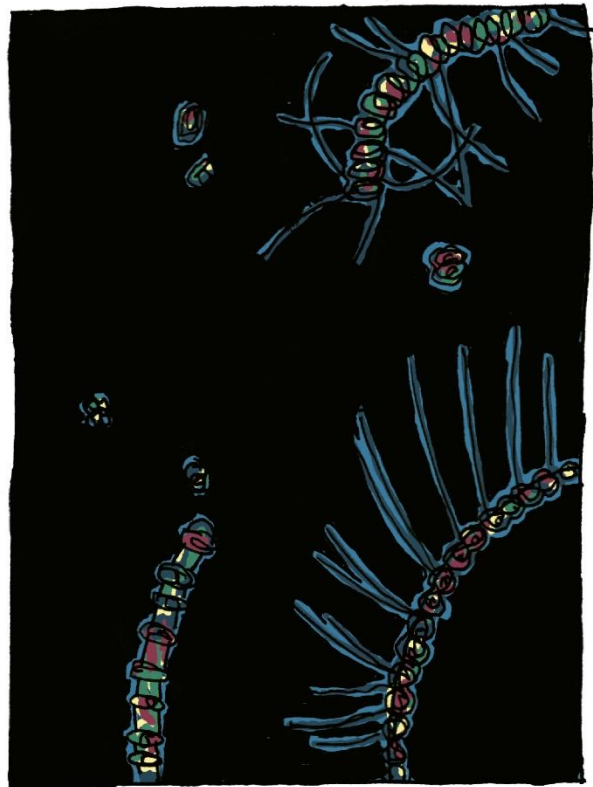
















This article is adapted from Fiske and Fischer's forthcoming graphic novel, *Toxic: A Tour of the Ecuadorian Amazon* (Toronto: University of Toronto Press). Click [here](#) to learn more.

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