

## Infrastructural Ontologies

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### Introduction

In the early 1970s, legal scholar Christopher D. Stone posed the controversial question *Should Trees Have Standing?* (Stone 1974). He asked this legal question, which he answered in the affirmative, in the context of increasing recognition of industrial pollution of rivers and forests in the US; a problem that was hard to deal with, in his estimation, because it was impossible to represent trees or bodies of water in courts of law. Stone recognized that his proposal would be viewed as outrageous and he answered some of the predictable objections head on: “The fact is, that each time there is a movement to confer rights onto some new ‘entity’, the proposal is bound to sound off or frightening or laughable. This is partly because until the rightless thing receives its rights, we cannot see it as anything but a *thing* for the use of ‘us’—those who are holding rights at the time” (8). He also dismantled the objection that the proposal would be impossible to implement “because streams and forests cannot speak”, noting that neither can corporations, universities, infants or states (17). Finally, he did not accept the view that forests only merit legal consideration to the extent that they provide profits to its human users. “Why”, he asked, “should the environment be of importance to us only indirectly, as lost profits to someone else? Why not throw into the balance the cost *to the environment?*” (27).

In 2010, the cultural anthropologist Marisol de la Cadena posed a question, which is noteworthy both for its similarity to Stone’s and for the fact that asking it is still equally controversial. During her ethnographical work with indigenous movements in Peru, de la Cadena followed protests against a mining project at the Ausangate mountain. De la Cadena was repulsed by the mine because of its adverse effects on local populations, but as she found, for her informants this was only part of the problem: “Ausangate would get mad, could even kill people” (2010: 339). As her interlocutors saw it, the Ausangate was indeed a non-human entity, a *tirakana*, earth-being, not an inert lump of material. Analogously to Stone she asks: “How might Ausangate be brought to

bear on Peruvian politics not as an object, a mountain, but as an agent, an earth-being?"

To be sure the concerns and solutions of Stone and de la Cadena are different. Stone is arguing for a model of guardianship, whereby natural entities can be represented in court by their "friends", such as the Sierra Club and other environmental organizations. In contrast, for de la Cadena, bringing earth-beings to parliament requires inventive alliance between a motley crew of actants, capable of troubling "the monopoly of science to define 'Nature'" (346). Here she draws on the work of the Belgian philosopher of science Isabelle Stengers' injunction to "slow down reasoning", a notion that has also inspired Bruno Latour's *Politics of Nature* (2004).

Nevertheless, at a certain level the similarities remain. The issue in both cases concerns how to bring nonhuman entities into politics and law, or how to bring politics and law into nature. Whichever direction is implied, what is required is an expansion or reconfiguration of what politics and law is, due to a recognition that the actors that inhabit the world for which policies and laws are made are themselves must more diverse and divergent than allowed by humanist or liberal theory.

Taking streams, forests and mountains (or how we might designate them) seriously thus means that recognizable forms of agents are expanding, spheres of agency transforming. And if we were to designate such processes with a single word we would be hard pressed to find a better one than ontology: the ontologies of mountains/earth-beings are different from what liberal politics assume, so their increasing visibility entails reconfigurations of what such politics, its institutions, and modes of due process are – that is, it entails changes in *their* ontological composition. If anyone has been looking for good examples of what Annemarie Mol (1999) meant by ontological politics, they need look no further.

Today I will look more closely at the implications of this interpretation of ontological politics. I will do so, however, not with reference to mountains and streams "directly", as it were, but by way of thinking about environmental infrastructures. In fact, I suggest that environmental infrastructures are particularly good objects to engage if one aims to understand ontological

transformations of the kinds just described. Traditional infrastructures, such as roads or sewers, are obviously material artefacts, but no one would claim they are “natural”. They are technical, social and institutional, second nature built on top of, and built to deal with, first nature – the real one consisting of streams and mountains. Yet, as we shall see, infrastructures cross and mix the boundaries between the natural and the social in multiple ways and this poses both challenges and possibilities for the kinds of ontological politics promoted by both Stone and de la Cadena.

What follows can be considered as a thought experiment concerning the resources that might be brought to bear on the issue of ontology. If our “ontological objects” are not found as or in nature, but rather emerge where divergent entities and projects run into each other, realign or clash, then what happens to questions such as whether trees or mountains should have standing?

### **What is infrastructure?**

Infrastructure has not been a predominant anthropological preoccupation, but we can consider Marshall Sahlins’ recent article “Infrastructuralism”. Sahlins reminds us that Lévi-Strauss located ethnology at the level of what Marx called superstructure, in opposition to the economic “base” (2010: 372). However, he continues to obviate that distinction by encompassing praxis in culture (373). “Rather than a discontinuity, temporal as well as ontological, wherein culture appears as the symbolic afterthought of a material practice that has its own rationality”, he suggests, “what is entailed in infrastructuralism is the realization of encompassing conceptual schemes in the particular material function of provisioning the society. Economy, we might even say, is the objectification of cosmology” (374-5, see also Tambiah 1977). However, if culture is not the symbolic afterthought of a material practice, Sahlins’ scheme is more prone to rendering materiality as the practical afterthought of conceptual schemes. Even if Sahlins’ characterization creates a potential relation between cosmology and infrastructure it is not so obvious what role materiality can actually have within this analytic horizon.

This appears to be the case also for other ethnographic studies that deal with infrastructure by focusing on issues such as “phatic labour” (Elyachar 2010)

or their social and symbolic aspects (Simone 2006). But for now I would like to turn to another example, which does not make use of the analytic category of infrastructure, though it might well have done so: Hugh Raffles' book *In Amazonia* (2002). I shall have subsequent occasion to remark on other river infrastructures and ontologies both in- and outside Amazonia.

One of the enduring messages of Raffles' book is that "trees and people create each other", so that "the histories produced in nature are biographical, unpredictable and deeply affective" all at once (8). Thus, the Rio Guariba is the product of relations of commerce, such as timber trade, sugar plantations, and the current urban popularity of acai berries. The river has been shaped throughout history by people looking for opportunities and by the labor they put into cutting streams, digging channels, diverting water (5). Raffles' account of these river histories is premised on the simultaneous existence of the river's "blatant physicality and its enduring imaginaries" (3). As in the literary genre of magical realism the landscape is "at once material and fantastic" (4). In Raffles's sense, natural history entails recognition that "nature is both a dynamic actor and a decisive ground in the contemporary politics of place-making and in the ongoing struggle over everyday life" (68). The fantastic aspect of natural history is elicited as what he calls "histories of creativity" involving multiple agencies (34).

Raffles offers a compelling depiction of the Rio Guariba as a sociomaterial infrastructure. However, I want to dwell a bit on the way he relates riverine and social histories. For although their entwinement is the premise of Raffles's book, they continue to also separate from one another. If, as Raffles' writes, the landscape is at once material and fantastic, the description relies on an opposition according to which the material as such is not, cannot be, fantastic. It is material *but also* fantastic, but the way in which the fantastic is evinced in *In Amazonia* is by paying close attention to the creative practices of local people as they work the river and create new relations amongst themselves doing so. The river generally figures as materiality upon which humans work. It might easily be seen as part of their infrastructure but in the emphasis on practice and exchange, Sahlins evocative notion of an objectification of cosmology falls to the wayside.

Raffles begins his story with an aerial image of the Rio Guariba. This military image provides the contrast to Raffles' story, for as he shows, people on the river were also "making new worlds on their own" (2). Further, images and models are also part of global infrastructures. The image Raffles shows is tangential to his exploration, but in science and technology studies its construction might well have been a topic in its own right. Indeed, STS studies have paid much recent attention to the difficult processes of creating global information infrastructures, in support of both military and environmental projects. Whereas Raffles sticks closely to local world making practices, Paul Edwards' work on climate modeling aims to elucidate the difficulties of making infrastructure global. This entails some noteworthy reversals. For example, though Raffles insists on nonhuman agency, materiality becomes far more lively in Edwards' account. Indeed, in some ways, Edwards' infrastructure of global climate data comes across as considerably more "fantastic" than Raffles' Amazonian river infrastructure, even as Edwards has far less interest in symbolic imaginaries.

What are the problems faced by global climate modellers? For one thing, there is no option for these scientists of making a controlled experiment with climate, since no "control earth" exists (Edwards 2010, 140). The question is how to capture climate behavior in a way that sufficiently takes into account its complexity and scale. Of course, physics is central. According to the laws of physics, "the planet must remain, on average, in thermal equilibrium" (143). The issue is one of "energy balance" (144). Present modeling grids form rectangles with sides that are between 100 and 500 kilometers in length, and vertical dimensions up to 20 km (146). Within these grids various physical properties and their interactions are modeled and the outcome are predictions of climate behavior, such as weather patterns. But the relation between actual weather and models is recursive. To create good models, experimenters rely on "meteorological experience with the actual atmosphere, rather than [predict them] from the fundamental laws of physics" (152). The persistent "bootstrapping problem" is that models are needed in the first place because existing empirical data is too historically scarce and spatially patchy.

To determine whether a simulation model is good one needs to figure out whether it looks like the reality it simulates (183), but to do that you need a reliable picture of reality. But the lack of that picture is what propels the need for the model in the first place. Where nature stops, infrastructure begins, or models end, is fundamentally ambiguous in this situation. It's turtles all the way down.

Global climate models have literally created data for areas of the world where no actual observations exist. "Virtually everything we now call "global data" is not simply collected; it is checked, filtered, interpreted, and integrated by computer models" (188). Together these sociotechnical processes produce the infrastructure of global climate models, which Edwards describes as "a vast machine". They also produce dreams of ever-increasing ability to capture the complexities of climate processes. Yet, what, to my mind, is fantastic about Edwards' *Vast Machine* is not primarily this cybernetic dream, but the interfacing and transmutation of both first and second nature, which fundamentally destabilizes the notion that infrastructure "sits on top of" an underlying substratum. As a recent book title has it: "*Raw Data*" is an *Oxymoron* (Gitelman 2013). One way to both read and extend this claim is to say that this is because the notion of raw nature is equally oxymoronic. For Edwards, that insight does not derive from the Kantian recognition that humans invariably categorize the world, building imaginaries out of their failed attempts to reach natural bedrock. Instead, raw data is an oxymoron because of the processes of material alignment and transformation that enables scientists to know the world. Not a Kantian world, but a world like Niels Bohr's, where apparatuses of knowledge making cannot help change the world itself (cf. Barad 1998, Plotnitsky 1994).

But then what is that changeable world like? In other words, what happened to ontology? For Sahlins and Raffles, cultural schemes remain focal points of interest. But even if this orientation shifts dramatically in Edwards' infrastructural story of global data making, the emphasis is still firmly on science and technological practice. What, we might ask, if the river, the ocean, the trees, were the starting points of analysis? What would that look like? And what would be the implications for infrastructure and ontology?

### **From the Point of View of Nature?**

What does the vantage point of nature look like? For good reasons, this is not a typical question for anthropologists. After all, according to Latour's (1993) modern constitution, this is precisely the domain of natural, not cultural, inquiry. One might, however, turn to recent histories of the environment for explorations of this issue. Consider, for example, Richard White's fine little book *The Organic Machine: The Remaking of the Columbia River* (1995). As the title indicates, the book is about remaking the river, but how to conceive the river that is remade? White's solution is to consider the river as an "organic machine, as an energy system which, although modified by human interventions, maintains its natural, its "unmade" qualities" (xviii). Energy is White's central trope. "The flow of the river is energy", he says, but so is the electricity that is eventually extracted from it, the human labor applied to change the river, and the fat stored by salmons in preparation for their upstream journey. The riverine transformation depicted by White is not one in which untouched nature is gradually given cultural, infrastructural form. From the beginning, the river was an interactive system, in which flows of water, movements of fish, and the labor of Indians, entwined. But the kinds of relations that made up this system changed. White settlers began competing with Indians, then with each other, over natural resources. Whereas travelling the river used to be a life and death contest, it became easy, as boats become more powerful, dams were built, large-scale industrial and bureaucratic efforts to "control nature" (McPhee 1989) set in. As salmon depleted, electricity production soared. The energy exchanges of nature and culture took new form. Over the years, the river turned into what we would readily recognize as infrastructure, rather than natural system. The river became cyborg, an entity at once organic and machine. Indeed, as concerns with depleting salmon runs heightened, the river became virtualized in computer models too (106). Presently, "how electronic fish behave will lead to decisions on how fish in the actual Columbia...will be managed" (106).

Conceiving of the river as a complex system of energy flows enables this fascinating story. But there is a caveat. For of course the concept of energy has been developed by physicists to characterize the ability of an entity to perform work. Hence, it is no surprise that the same concept is crucial for Edwards' climate scientists concerned with the energy balance.

We can thus pause to ask about the extent to which it is *the river* that has spoken in his story, or whether physics is really the ventriloquist. As anthropologists, we also might wonder what happened to the people that are part of this organic machine? Now, White is by no means oblivious to the fact that humans have related to the river by way of diverse practices. He talks of local culture, of fishing rituals, and of changing communities. But the story subsumes these varied perspectives and practices; they form internal parts of the organic machine, rather than offering different versions of the river's existence. Using energy as an analytical device, it seems, is not neutral.

White's story can be contrasted with that of maverick journalist and scholar Michael Pollan, whose efforts to re-characterize natural infrastructures beautifully exemplify what writing from the point of view of nature might look like. Pollan, too, is concerned with the possibilities and challenges of describing changing relations between nature and culture in a way that does not presuppose humans as the central actors. His book contains chapters on four human desires: for sweetness, beauty, intoxication and control. The emergence of each of these desires, in specific histories and places, is painstakingly documented, with reference to particular plants that gave rise to them. We might think of his book *The Botany of Desire: A Plant's-Eye View of the World* as an exploration in "planthropology" (Pollan 2002). Thus, Pollan documents the American desire for sweetness as emergent and consequent upon the travels and tribulations of apples. Earlier, the beauty of tulips was an obsession for the Dutch. Marijuana and the desire for intoxication have been inseparable in the U.S., Europe, and elsewhere. And the potato can be affiliated with a desire for control.

Now Pollan's favored trope is co-evolution. Plants, like apples and marijuana, and humans, "are partners in a coevolutionary relationship" (xii), in which both need each other for divergent ends. Plants care not a whit about human desires, but only about their own genetic propagation. But the way in which they ensure this propagation is by "playing on the animal's desires, conscious or otherwise" (xiii). And no animal is more creative in finding ways to gratify its desires than the human. About ten-thousand years ago, Pollan reminds us, happened the event that we would "somewhat self-centeredly", call "the



invention of agriculture” (xix). From the point of view of plants, however, this invention can be seen as the effect of one of *their* strategies: “getting us to move and think for them” (xix). Gradually, plants evolved, so “compelling and useful and tasty they would inspire human beings to seed, transport, extol, and even write books about them”. And also change the very landscapes and infrastructures through and in which they live. Apples, Pollan argue, “helped remake the New World landscape in a more familiar image, in the process of contributing to an ecological transformation of America the magnitude of which we’ve just begun to appreciate (45). That reshaping involved transportation systems, the creation of settlements that turned to towns, liquor production and legislation against it, and a gradual reconceptualization of the apple as a symbol of moral Americanness itself – as American as apple pie, as the saying goes.

Both White and Pollan’s books in environmental history offer important lessons for an understanding of the changing relations between nature and culture, mediated by emerging infrastructures, and changing practical ontologies. Both can be seen as exemplifying what STS scholar Andrew Pickering (1995) has called “a dance of agency”, an ongoing process in which entities, such as rivers, virtual models, Indians, salmon, apples, laws, dams, and much else mutually transform one another. In these stories, people are located as part of nature, rather than as its opposite, for there is no outside. Per implication this must extend to the teller of the stories too. If there is no outside, description is the outcome of one “part of the world having observed another part of the world”, as Italo Calvino’s character Mr. Palomar formulates it (116). Mr. Palomar wonders if it might even be the case that the “I” is the window through which the world observes the world” (116).

I think there is much to be said for that view. Yet, that does not render the window transparent. White’s world is ultimately an energetic flow, whereas Pollan’s planthropology is one of genetic co-evolution. But as I have intimated the qualities of this “ultimately” remain ambiguous. Is it so obvious that nature must speak in the language of physics or biology? If Sahlins’ is right to say that economics is the objectification of cosmology, would that not equally be the case for the natural sciences? In that case, for all their interest in enriching our understandings of nature-culture interrelations, are White and Pollan not

replicating Western cosmology? We are getting closer to the core issues that I think arise from current ontological thinking. To sharpen these points I turn to a set of anthropological examples that orient to infrastructure and ontology in quite different ways from what we have encountered so far.

### **Myth and Infrastructure**

Christine Hugh-Jones's 1979 publication *From the Milk River* would seem to have little to do with infrastructure. Ethnographically, it focuses on the Pirá-paraná area in Northwest Amazonia, inhabited by Tukanoan groups (6). Hugh-Jones' focus is on what she calls spatial and temporal processes among these groups. Engaging the classical themes of myth and kinship through social-structural analysis, she notes the correspondence between locations of habitation along the river and social prestige (25). As Raffles' much later work, she outlines diverse usages of the river. Much more important for her analysis, however, is the fact that each "exogamous group above sib level is derived from an anaconda ancestor" (33). The earth was originally populated at a "string of sites", referred to as "people waking-up houses" (34). Ancestral anacondas were "anacondas in the water but...whenever they came on land at the waking-up houses, they were transformed into groups of people who danced and performed ritual" (35).

Most of Hugh-Jones's analysis is dedicated to outlining a series of models that account for social practices such as food production and consumption, habitation in the long house, and marriage patterns, by relating these practices to the motifs of the anaconda ancestors and their movements, and to the relations between different cosmic habitats. Thus, for example, she depicts a transformational system, whereby movable parts, including the changing human body, anaconda body, and the womb, map onto a set of immovable parts, namely the house, the broader long-house setting and the universe at large (237-238). She also extracts two alternative models of the river systems of the earth, strikingly named the single and double-anaconda model, both of which are based on the observation that the river and the anaconda "are treated as analogous systems". Thus, the river is depicted as a continuous and doubled flow that on the one hand moves water and distributes people downstream and upstream

and on the other hand distributes evil forest spirits upstream and ancestors downstream (240-242).

What is particularly relevant is the extent to which the analysis engages the Milk River from the Tukanoan point of view; that is, not as a system based on the conservation of energy but as a transformational and analogical system, in which social relations, practical issues of livelihood, evil spirits and anaconda ancestors co-exist. Though this is not Hugh-Jones's concern, we might readily conceive of this system as a vastly expanded infrastructure, capable of encompassing "natural", "social" and as well as "spirit" rivers. Hugh-Jones, however, would seem to discourage such a view. To be sure, she presents the universe as a "conceptual construction which contains the activity and power associated with ancestral creation" (235). However, she also insists that: "people must transpose the system of the universe with its creative processes onto the concrete systems which they are able to control, or at least change, through practical action. Thus, the concrete world is derived from the 'imaginary' ancestral world, but it also provides the way to it". In the end we are witness to a significant reduction: "whatever people are doing in metaphorical terms, in real terms they are acting within the confines of the longhouse setting...Thus, when they identify themselves with ancestors, they are actually putting on feather head-dresses, drinking yagé and so on" (236). This retraction removes from the double anaconda model any claim to reality, except as a conceptual structure that enable people to act practically. Cosmology and myth becomes an epistemological aid to concrete social action, rather than an integral dimension of ontological infrastructure.

Hugh-Jones's deliberately refrains from "entering into the difficult subject of the relation between myth and history" (39). In contrast, Peter Gow's (2001) *An Amazonian Myth* explicitly engages this topic, and its way of doing so provides important resources for getting beyond the duality between nature and culture, upon which Hugh-Jones's analysis ultimately relies. Gow's study focuses on Piro and Campa people in and around Santa Clara on the Urubamba River. Generically, the situation looks similar to the ones described by Raffles or Hugh-Jones: thus Piro people also rely extensively not only on the river but also on the forest for their sustenance and livelihoods. "For as long as records exists,

Urubamba Piro had been at the centre of a complex network of riverine trading” (199). However, this riverine network is not the primary concern of Gow. Instead, he is concerned precisely with the relation between myth and the histories through which this network formed and transformed.

Contrary to Hugh-Jones who separates metaphorical myths from practical action, Gow shows the dense relations between infrastructure and cosmology. Specifically, transformations in the content of myths are not, for Gow, detached from peoples’ novel experiences with aircrafts, new boats, forms of writing and other technologies. “Here, on the Urubamba”, one informant said, “we say that the gringos, off there in the USA make these things [outboard motors for boats] in schools, as handicrafts. You know the way our children make little bows and arrows and little clay pots” (52). Myths, or ancient peoples’ stories, enable Piro people to grapple with these issues, and change themselves in the process. Thus, transformations of infrastructure, in Gow’s analysis, is “co-ordinated with a transformation in Piro people’s ideas about celestial beings” (191). The purchase of Gow’s analysis is that infrastructural change does not have to be separated from cosmological issues. Both partake in a generalized system of transformations, which simultaneously accords myth with history and infrastructural change with cosmological consequences. One of the reasons why this is difficult to recognize is that from the Piro point of view, ancient people’s stories are characterized by being unchangeable and unhistorical per definition: “while living people may experience themselves as being ignorant of them, as having forgotten them, or as having told them badly, they cannot experience themselves as having invented them”, for they are precisely the “things that do not change” (285). But while this gives myths stabilizing force, that force is itself acquired only by changing that which is stabilized. It enables people on the Urubamba to engage in incessant infrastructural transformation while insisting that not much has really changed.

We are now in a position to connect these diverse stories of infrastructure, rivers, practical action and myths in an argument about what ontology might mean for present day anthropology and STS.

### **Infrastructural Ontologies**

In the introduction, I proposed that infrastructure offered a particularly interesting vantage point for anthropological conceptions of ontology, inasmuch as they are places where the natural and the social mix and take new shape. That vantage point has shaped my exploration of what infrastructure then might mean. I hope we have moved along a path that make visible the liveliness and consequentiality of infrastructure. I have also aimed to indicate that the qualities of that infrastructural and, per implication, ontological liveliness can be engaged in radically different ways.

On the one hand, given the anthropological context, I have wanted to pose a question which origins in science and technology studies. Formulated by John Bowers it sounds thus: “If there is contingency, creativity and situatedness in human affairs, why can there not be contingency and the rest” in technology and infrastructure (Bowers 1992, 240)? Or, put in other terms, is Sahlins’ depiction of infrastructuralism, as a reversal, whereby economy or technology becomes objectified cosmology, the only alternative to a view of infrastructure simply as a set of inert material arrangements? Obviously I do not think so.

As a barely concealed subtext, I have had on my mind Viveiros de Castro’s call for redefining anthropology as a theory of people’s ontological auto-determination and a permanent decolonization of thought (2011, 128). Viveiros de Castro quotes with approval J. M. Coetzee’s *Elizabeth Costello*: “We have left behind the territory in which we were. We are in the far territory, where we want to be”, and I could not agree more. The questions that follows, of course, are “where is that” and “how to get there”, and it is with an interest in addressing these questions that I have offered today’s tour of varied ontological habitats.

In 1991, the sociologist of science Joan Fujimura wrote a book chapter entitled “On methods, ontologies, and representation in the sociology of science: Where do we stand?” Among other things she noted the complexities arising from the fact that analyses of people’s practices now occur alongside “their own analyses of their society and its working” (207). And she called for the need for “preserving the integrity of those we write about”, while also finding ways of including “new and diverse perspectives” (208). All prescient concerns and laudable aims, now as then. However, insofar as issues of ontology are in the air, and insofar as ontology comprises not only people’s perspectives but also their

infrastructures, Fujimura's notion of integrity no less than Viveiros de Castro's proposal for autodetermination, generate quite a few perplexities of their own.

I began the introduction with a consideration of the odd constellation of de la Cadena's tirakana, earth beings, whose human representatives struggle to get into Peruvian parliament, and Christopher Stone's plea for granting trees and rivers standing in American courts of law. If both of these cases raise issues of ontology, they also raise questions of precisely which new perspectives are to be brought into our descriptions, which forms of integrity are to be preserved and how, and whose autodetermination is at stake. These questions are not disconnected from an overarching issue at stake today: where does ontology reside and how can it be rendered amenable to description and analysis? As noted, when Stone aims to procure standing for trees, he rather too quickly introduces a notion of guardianship and transfers it to the Sierra Club. But how would it know what trees really are, want, or need? It was with this question in mind I turned to the different environmental histories of White and Pollan, which are equally striking for the ways in which they do make present something like the agency of rivers and plants *and* do so on the basis of Western scientific concepts. So is it really Western science that finally arbitrates of which ontology consists?

Though that notion might hold appeal for Stone, it is hardly satisfying us today. In contrast to Stone, whose explicit interest is in the standing of *trees*, de la Cadena came to recognize the importance of earth-beings because of her serious interest in Peruvian *indigenous movements*. Her central point is that earth beings are precisely not mountains as Western science conceive them. And yet, this point is reached exclusively by engaging with indigenous categorizations. Even if no one here is likely to believe in unmediated access to a Kantian *ding an sich* it is yet striking to note that the material infrastructures and the agency of nonhumans -- so prominent in STS -- vanish in this story. Mountains, too, become objectified cosmology. It seems that the dichotomy is reiterated. Either an interest in material agency turns out to ultimately reaffirm Western naturalism, or an interest in indigenous ontologies turns out to be an updated culturalism, depending on explication of native categories, stories and myths. However, these are not the two only options. It may yet be possible to articulate a perspective

attuned to the wild heterogeneity, contingency, creativity, and world-shaping implications of infrastructures themselves.

I offer a final detour out of the Americas, to Thailand. Here, too environmental infrastructures are in the making. The Thai anthropologist Jakkrit Sangkhamanee studies these processes in terms of conflicting cosmologies of water. On the one hand, modern hydrology and water management practices have made an influx in the Mekong due to conflicts over water, flooding risks and environmental hazards. Western knowledge practices and infrastructural endeavors are very present in this context. On the other hand, on the Mekong, as elsewhere, local people are increasingly invited to contribute to water management processes. Much of Sangkhamanee's story centers on practical action and the local knowledge of villages in dealing with the river in environmentally sustainable ways. However, those dealing also entail engaging with Naga, serpentine deities, that inhabit rivers in South East Asia. Of course, Thai scientists and modern participatory experts view these naga as symbols lacking reality. Yet villagers do not. Thus, Mekong river management now comprises tentative discussions about how to accommodate naga within environmental management regimes. In all likelihood both environmental infrastructures and naga will transform in the process.

I end with this story because it allows me to crystallize my main points about the relation between infrastructures and ontologies. Ontologies cannot be defined in terms of Western naturalism but neither can they be elicited exclusively through indigenous categories. Instead, infrastructures can be seen as key construction sites for multiple, divergent ontologies. Infrastructures may facilitate the co-existence of incommensurable ontologies, as seems to be the endpoint of Gow's analysis. But they may also enable the formation of local micro-worlds (Verran 2002) in which forms of nature and culture transmute, which seems to be what is at stake in the stories of the naga in the Mekong and of Peruvian earth-beings. We will never know what the self-defined ontologies of these beings are or what standing they ought to have on their own terms. But we can examine how they enjoin relational infrastructures that are perhaps already far more exotic than we too readily assume. That endeavor might be defined as an exploration of practical ontologies.

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