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Geological Surprises:
State Rationality and Himalayan Hydropower in India

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> *Most hydro projects have been adversely affected by* geological surprises *especially during underground tunneling in the relatively young Himalayan Mountains…* Even with the best of geological investigations*, occurrences of shear zones and underground lakes and streams can result into [sic] serious time and cost over-runs.*
>
> Ministry of Power (2008: 2, 27), emphasis added.

When I first encountered the paragraph above, I was working in an NGO in Northern India that was collaborating with a local anti-dam movement against large dams coming up on the Ganga River. Struck by the anthropomorphic language, I pointed it out to my colleague and we laughed at the thought of the "relatively young Himalayan mountains" playfully sneaking up on Indian hydropower developers. It also seemed unlike the technocratic elite to admit their exasperation with an unruly landscape that would not yield "even with the best of geological investiga-

tions." A few years later, in 2011, when I began my graduate studies, my field site of Sikkim, an Eastern Himalayan state where twenty-nine dams are being planned for construction on the Teesta River, experienced a 6.9 magnitude earthquake. In reality "geological surprises" are no laughing matter. The earthquake's epicenter located in North Sikkim was close to two under-construction projects; downstream communities were forced to evacuate their homes and landslides triggered by the earthquake killed several hundred people. The visceral materiality of our planet's geological ebbs and flows serve as a stark reminder of the disparity between geological time and human and infrastructural timespans. As public opinion in Sikkim swiftly turned against these projects, I revisited the phrase "geological surprises" in the light of this disaster; this time it struck me how state innocence or what others have called "strategic ignorance" (Lord 2018) was implicit in this phrase. However, if we were to take the state on its word that, despite deploying the best of geological expertise, the Himalayan landscape's unintelligibility had thwarted its well-laid out infrastructural plans, could this absolve the state in the event of a "geological surprise" such as Sikkim's September 2011 earthquake? Building on the provocation of this collection to consider multiple temporalities that contribute to "the making and unmaking of infrastructure," I examine how geological, colonial, and scientific temporalities coalesce to produce uneven geographies of risk and development in the Indian Himalayas.

A news report from NDTV India notes how Sikkim's 6.9 earthquake in 2011 resulted in concerns around dam safety. Source: https://www.ndtv.com/india-news/quake-aftermath-many-villages-in-sikkim-still-cut-off-thousands-waiting-for-help-468191

Dam building is not a new technocratic enterprise for the postcolonial Indian state, but in the last decade the geographic focus has shifted from Central and Western India to the Himalayan borderlands. In 2003, India launched a 50,000 megawatt hydro-initiative that envisioned the Himalayan region as the country's "future powerhouse" (Dharmadhikary 2008). Along with a regional shift, we find a shift in technology – from large reservoir dams to run of the river or diversion dams that require tunneling through seismically fragile mountains. *The Hydro Power Policy 2008* reassured private developers of a "level playing field" (Ministry of Power 2008: ii)

and stressed how the technological shift to diversion dams would lead to speedier project completion. Since land would only be required at two ends of the tunnel this meant fewer project-affected people and less opposition. However, the policy noted other roadblocks. In addition to the inaccessibility of project sites, the temporal cycles of the monsoon rains, and accompanying landslides and flash floods, there was the matter of "geological surprises." While the policy does not unpack this term, from the paragraph cited above we can infer that earthquakes are not the primary geological surprise that concern developers. After all, earthquakes in the "young" and the restless Himalayas are hardly a surprise to anyone and most Detailed Project Reports boast of how reservoirs are meant to withstand major seismic events. Instead the geological surprise hindering these projects was the encounter with the invisible, internal properties of the landscape, its "shear zones and underground lakes and streams" (Ministry of Power 2008: 27) – that were not readily accessible for examination. Opposition was expected not so much from people but from the earth itself – the "friction" of the Himalayan terrain (Scott 2009; Tsing 2005), if you will. In

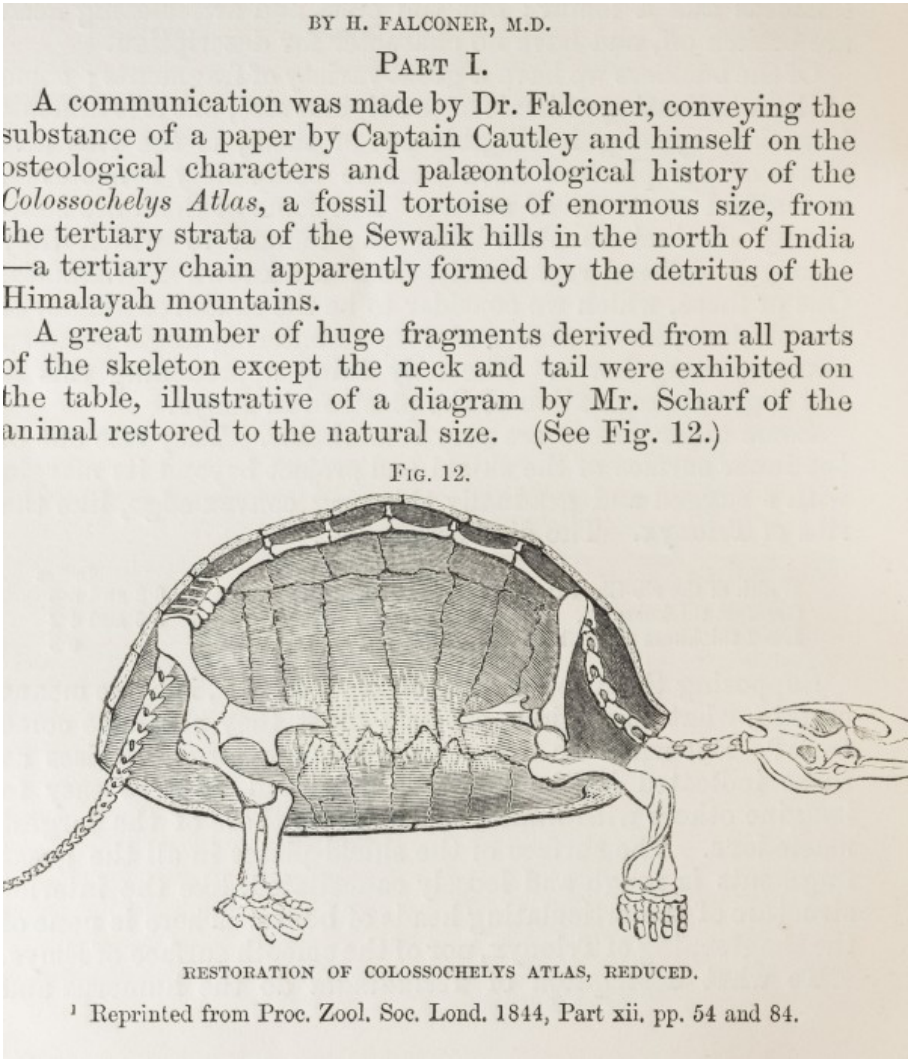
Tunneling work on Teesta Stage III in Chungthang, North Sikkim.
Photo: Mabel D. Gergan, 2012.

such a context, to keep the hydropower industry lucrative for private investors, an expert understanding of Himalayan geology, along with hydrology, seems crucial.

Critical scholars of South Asian environmental history and politics have examined how colonial scientific disciplines such as forestry (Sivaramakrishnan 1999; Robbins 1998) and hydraulic engineering (Amrith 2018; Akhter 2015) produced expert ways of seeing natural resources and how these legacies inform present-day state environmental rationality. Writing in the Canadian context, Braun (2000) demonstrates how the development of geology as an imperial science in the nineteenth century operationalized specific forms of state rationality, opening up "new epistemological spaces which, in turn, made possible new domains for economic and political rationality" (ibid.: 24). He argues that the representation of particular landscape as something from which value could be extracted constituted its "reterritorialization," "erasing existing social natures … and, in their place, restaging the landscape as a solely geological artefact" (ibid.: 15). The Himalayan landscape, specifically its geological characteristics and how they are represented by the Indian state in policy documents should therefore be understood as "historical rather than natural – situated within specific historical geographies of 'seeing' and 'ordering' nature" (ibid.: 14).

Historian of science and technology David Arnold presents a fascinating account of how geology as a discipline was rather slow to develop because of a general sense among colonial officials that India's geology had less to offer in terms of scientific interest as compared to botany or zoology. Drawing on the accounts of amateur geologists writing in the early eighteenth century, Arnold notes how early investigations, "stirred little geological excitement and yielded few fossils. In remoter, less populated regions, 'impenetrable jungles' allowed only a 'vague and scanty knowledge' of underlying strata…. Compared with Europe, the geology of India appeared 'far less complex' even 'monotonous'" (2000: 45). Much of the early interest in the discipline came not from established institutions but from colonial officers who were personally interested in geology. Hugh Falconer, a young East India Company surgeon and superintendent of the Saharanpur Botanic Gardens, is credited with the discovery of fossils in the Shivalik hills (the lower Himalayas) – a momentous find for Indian paleontology and for wider discussions of climatic change and extinction. Albeit a different kind of geological surprise the discovery of the Shivalik fossils, along with several early geological finds, occurred through an infrastructural encounter during the construction of canals and railways that "ran a scalpel through the landscape" and required deep excavations (ibid.).

Shortly after the discovery of the Shivalik fossils, as British policymakers accepted geology's newfound scientific standing and its economic utility to the Empire, the Geological Survey of India (GSI) was founded in 1851 to find coal deposits for the Indian railways. In a powerful indictment of the discipline, Neel Ahuja (2016) argues: "Like all colonial science… [geology] cannot be understood outside of the context of the relations of place, labor, and production that mobilize it." Today GSI is attached to the Ministry of Mines and is actively reproducing the colonial extractive logic through the exploitation of mineral resources primarily on tribal and Adivasi territories across India[1]. In Sikkim and other Himalayan states, GSI has contributed the geological expertise for Detailed Project Reports and Environmental Impact



BY H. FALCONER, M.D.

PART I.

A communication was made by Dr. Falconer, conveying the substance of a paper by Captain Cautley and himself on the osteological characters and palæontological history of the *Colossochelys Atlas*, a fossil tortoise of enormous size, from the tertiary strata of the Sewalik hills in the north of India —a tertiary chain apparently formed by the detritus of the Himalayah mountains.

A great number of huge fragments derived from all parts of the skeleton except the neck and tail were exhibited on the table, illustrative of a diagram by Mr. Scharf of the animal restored to the natural size. (See Fig. 12.)

FIG. 12.

RESTORATION OF COLOSSOCHELYS ATLAS, REDUCED.

[1] Reprinted from Proc. Zool. Soc. Lond. 1844, Part xii. pp. 54 and 84.

A drawing of a fossil tortoise found in the Shivalik hills.
Source: http://falconer-museum.co.uk/falconer-fossil-collections/.

Assessments for hydropower projects, which are notorious for having glaring inconsistencies, falsified information, and plagiarized data – all in the service of easing the process of getting clearance for hydropower developers.

The uneven geographies of risk and infrastructural development in the Indian Himalayas form on historical terrains shaped not only by specific geologies but also by the powerful, unbroken legacy of colonial and postcolonial state rationality. For critical scholars invested in the Himalayan region and, more broadly, infrastructure in postcolonial contexts, geology's entanglements with state power presents an important field of inquiry. A deeper understanding of geological temporalities would better prepare this region and its inhabitants for both infrastructure development and disaster prevention, but given the colonial roots of institutions like GSI, when these two priorities are at odds it is anybody's guess which prevails. In deploying the language of "geological surprises," the Indian state attempts to displace culpability and demonstrate its incapacity in the face of geological time. However, what is obscured

in this narrative of state innocence is that despite acknowledging that tunneling through seismically active landscapes is a fraught endeavour, in places like Sikkim few measures were taken to fortify hillsides or examine impacts on underground water channels. While the invisible, internal properties of the landscape slow down infrastructural timelines, it is important to remember that development is not the only goal here (Ferguson 1994) and there is opportunity even in disaster (Paudel and Le Billon 2018). With larger geopolitical and nationalist agendas at play, it is unlikely we will see a decline in hydropower development in the Himalayas anytime soon. Therefore, the question we must ask is not why these projects persist despite their apparent failure, but how scholars can make visible and challenge the underlying logics of these infrastructures and the expertise that bolsters them. A deeper engagement with colonial histories of science and expertise is therefore crucial to both academic and policy-level responses to the intersection of disasters and infrastructure in the Himalayan region, allowing us to see pernicious continuities and perhaps even to envision, alongside the communities we work with, alternative futures.

Notes:

[1] There is a separate research institute dedicated to the study of the Himalayan region – the Wadia Institute of Himalayan Geology which began much later, in 1976, and is conducting important research on glaciers, natural disasters, and climate change.

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