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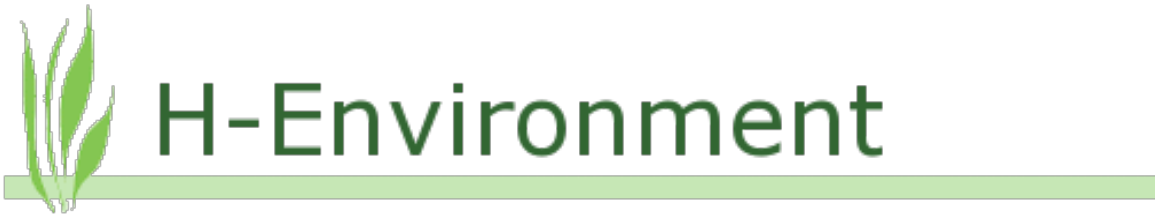

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Introduction by Jacob Darwin Hamblin, Oregon State University

Global warming has become the stuff of history. While politicians and scientists hash out the details and jockey for authority, historians are beginning to integrate contemporary global warming into existing historical narratives. Granted, there have been climate changes in the past, and these have entered the historical record with names such as the Medieval Climate Anomaly and Little Ice Age. Such events continue to fascinate historians, scientists and politicians alike, because they seem to offer insight on the crucial question of what causes climate change.[1] Yet our obsession with causes might divert attention from effects. Or better yet, it can blind us to the importance of environmental change itself as a cause for the unfolding of power relations in various parts of the world.

In his recent book, *In the Shadow of Melting Glaciers*, Mark Carey identifies glacial retreat as a historical reality that has played a substantial role in the political, economic, and social dramas of South America. Carey's book challenges us to think less like climate modelers and more like historians, anthropologists, and geographers. Understanding the true effects of climate change "requires knowledge of distinct societies," he writes, along with their particular governments, institutions, scientific knowledge, religious values, and all the other trappings of life (p. 5). Doing so might seem like a daunting task, but Carey takes up the challenge with relish, and delivers an analysis of how disasters wrought by glacial retreat have refashioned both the natural and political landscapes of the Peruvian Andes in the twentieth century.

The gallery of commentators assembled here is truly interdisciplinary. I asked anthropologist Julie Cruikshank to contribute because of her work on glaciers in an entirely different society, the Yukon Territory of Canada. She has spent years exploring the tensions between indigenous knowledge and Western science. In her 2005 book *Do Glaciers Listen?* she outlined the conflicts of worldviews between indigenous peoples who attributed spiritual, sentient qualities to glaciers, and colonial Europeans who treated them as inanimate objects. Her work also has shown how divergent historical narratives have represented power struggles between indigenous people and Westerners.[2]

Shawn Van Ausdal is a geographer, and his work takes us closer to the scene of the action in Carey's book. He is the only one of the commentators to be physically located in the region, though in the Colombian rather than Peruvian Andes. His

[1] Michael E. Mann, Zhihua Zhang, Scott Rutherford, Raymond S. Bradley, Malcolm K. Hughes, Drew Shindell, Caspar Ammann, Greg Faluvegi, and Fenbiao Ni, "Global Signatures and Dynamical Origins of the Little Ice Age and Medieval Climate Anomaly," *Science* 326:5957 (2009), 1256-1260.

[2] Julie Cruikshank, *Do Glaciers Listen? Local Knowledge, Colonial Encounters and Social Imagination* (Vancouver: UBC Press, 2005). See also Julie Cruikshank, "Images of Society in Klondike Gold Rush Narratives: Skookum Jim and the Discovery of Gold," *Ethnohistory* 39:1 (1992), 20-41.

writing explores the relationship between economic systems and the environment, and like Carey he confronts the competing political ideologies behind economic projects and business ventures. For example, he rejects as a stereotype the notion that cattle ranching in Colombia served mainly as a tool of territorial expansion. Instead, he has used corporate archives to demonstrate what he calls "the logic of livestock," namely that it was indeed intended to turn a profit.[3]

Eve Buckley's work has been at the intersection of environmental history, the history of science and technology, and the history of Brazil. Like Carey, she investigates the political motivations and implications of major public works projects, such as roads and dams. Her work has demonstrated how civil engineers in Brazil, true technological optimists, believed that such works would lessen social inequality in rural, impoverished areas, by giving them access to urban areas and services. And yet the influx of federal money actually had the opposite effect, by increasing elites' control over land, water sources, and labor. This work highlights the political uses of science by "reigning powerbrokers," revealing how contingent regional development schemes have been upon local politics and culture.[4]

As a final commentator, I asked geographer Gregory Knapp to contribute, given his longstanding interest in the region's peoples and environmental conditions. Knapp has written numerous accounts of the Andes, covering vast stretches of time from prehistory to the present. This has included reconstructions of past farming practices and attempts to map indigenous territories using census data. He also has written at length on the "adaptive dynamics" of cultures in the Andes region, revealing how peoples (particularly in Ecuador) have changed their food production strategies over time. Methodologically, he has blended historical documents, ethnography, soil analysis, and mathematical modeling to produce convincing portraits of how societies have adapted not only to environmental conditions but also to changing views of territorial rights and labor practices.[5]

Before turning to the comments, I would like to extend my thanks to Mark Carey and all the participants in this roundtable, for writing in the spirit of productive debate and dialogue. In addition, I would like to remind readers that as an open-access forum, *H-Environment Roundtable Reviews* is available to scholars and non-scholars alike, around the world, free of charge.

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[3] Shawn Van Ausdal, "Pasture, Profit, and Power: An Environmental History of Cattle Ranching in Colombia, 1850-1950" *Geoforum* 40:5, 2009, 707-719.
[4] Eve E. Buckley, "Political Impediments to Technological Diffusion in Northeast Brazil, 1909-1964," *Comparative Technology Transfer and Society* 7:2 (2009), 146-171.
[5] Gregory Knapp, *Geografia Quichua de la Sierra del Ecuador* (Quito: Ediciones Abya Yala, 1987). Gregory Knapp, *Andean Ecology: Adaptive Dynamics in Ecuador* (Boulder: Westview Press, 1991).

Comments by Julie Cruikshank, University of British Columbia

Mark Carey's history of recent climate change comes from the frontlines of the Peruvian Andes where melting glaciers have had their most extreme documented human impacts, so far. In 1941, well before the language of global climate change circulated widely, melting glaciers began to wreak havoc in valleys below Peru's massive Cordillera Blanca. On December 13 that year, an outburst flood roared down the Cojup valley into the town of Huaraz, killing 5,000 people and obliterating one third of the city within minutes. Since then, twenty-five thousand people have died in the Santa River valley as a direct result of glacier outburst floods: 5,000 at Huaraz; then 500 at Chavín in 1945; 200 at Canón del Pato in 1950; 4,000 at Ranrahirca in 1962; and 15,000 at Yungay in 1970. Statistics cannot convey the human devastation, but Carey painstakingly recounts the experiences surrounding each event. Carey is a historian, but his book provides intimations of what we may expect elsewhere during coming decades.

In the Shadow of Melting Glaciers traces events that followed these tragedies. Sequential actors became involved in evaluating hazards, attempting to control consequences of further melting. Initially, Peruvian state officials called on 'experts' - scientists and engineers - to assess the situation. Vocal residents provided input. Glacier lakes were drained and their banks fortified in efforts to mitigate risk. In following years, under the umbrella of successive Peruvian regimes, emphasis shifted from glaciers as 'hazards' to glaciers as potential 'resources' that store and regulate water flow. The language of glaciers as 'vanishing water towers' came into vogue by the early 1960s with proposals that water be released for the benefit of the modernizing state – hydro-electricity, irrigation, and tourism. Mountaineers and tour operators joined the list of actors. Carey's thesis is that "the history of climate change and glacier control ... is a history of power struggles, not just between humans and the physical environment, but among various social groups" (p. 6). Inevitably, some groups are more powerful than others. Hence, any discussion of adaptations to climate change must involve culture as well as science.

Carey broadens the list of participants to include *glaciers* as actors of significance in the unfolding story of climate change. Glacier retreat has been a powerful historical force influencing political processes in modernizing Peru (p. 11, 193), with ironic consequences. Glacier lakes once drained as 'hazards' were later enlarged and refilled with additional water to provide electricity for distant urban centers. The state-run hydroelectricity operation, created during the 1950s, was privatized in the 1990s, then sold and incorporated into U.S. based Duke Energy. Resources that might have benefited vulnerable populations were directed to urban electrification and massive irrigation projects on distant coastal plains. Carey's discussion of "neoliberal glaciers" (chapter 7) to mark the era of deregulation is apt.

Carey brings local knowledge into the equation (chapter 2), a direction I pursue here. Rural hill dwellers living high above the inundated towns had long experience

with glaciers and a sharp appreciation of the associated dangers, but their views rarely enter the science record. They avoided hazard areas and run-off paths. They viewed glaciers and impounded lakes as fully capable of communicating among themselves and responding to humans who breached local rules of reciprocity and engagement. Such narratives echo those told in the Saint Elias Mountains spanning the Alaska/Canada border where sentient glaciers also listen, pay attention and react swiftly to human indiscretion.[6] Local narratives address complex processes, though from different angles than science. They offer lived, experiential knowledge that might inform us about human adaptations to changing environmental circumstances.

Recent Latin American anthropology resonates with this theme. Eduardo Viveiros de Castro invites us to consider alternatives to our modernist conceit that nature and culture are unvaryingly understood as binary categories.[7] Naturalism, he argues, is now the default position for our Western cosmological categories of nature and culture, though this was not always the case. Naturalism takes as given a unified nature that provides the universal background for all life – a nature fully knowable only through science. In this view, our multi-cultural world may indeed contribute diverse 'beliefs' to the project of understanding nature, but such knowledge is always partial.

Amerindian perspectivism, Viveiros argues, is widespread in the Americas and offers a fundamental challenge to scientific naturalism. Perspectivism holds that the world is inhabited by a range of beings – human *and* non-human – including features of landscape. In this ontology, everyone understands that humans, animals and spirits (such as those inhabiting glaciers and glacier lakes) perceive the world from distinct points of view. Crucially, a defining characteristic of being fully human in such societies is the capacity to view these contrasting perspectives relationally. Capable humans can make the mental shift to grasp the perspective of an animal (or a glacier) and can assess how human observations might appear from the perspective of 'other-than-human', sentient beings. If 'nature' provides the essential background for science, the foundational Amerindian principle that binds and sustains all beings is this immanent 'spirit', more akin to culture than to nature. Nature, in this view, actually *differentiates* beings that share spiritual features – their radically differentiated bodies or shapes, how they move, how they transform, how they communicate, how they respond. Humans must be attentive to these differences in order to engage fully with the world around them. Viveiros's challenge is that if we are truly interested in indigenous knowledge, why not think about *multi-naturalism* (rather than multi-culturalism, a relativist proposal) as a concept with enormous generative power to see where this takes us. Of the

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[6] Julie Cruikshank, *Do Glaciers Listen: Local Knowledge, Colonial Encounters and Social Imagination. Vancouver UBC Press, 2005.*

[7] Eduardo Viveiros de Castro, 1998. Cosmological Deixis and Amerindian Perspectivism. *Journal of the Royal Anthropological Institute* 4(3): 469-488; 2004. "Exchanging Perspectives: the transformation of objects into subjects in Amerindian Ontologies. *Common Knowledge.*10(3):463-484.

candidates that might be called on to represent multi-naturalism in the 21st century, melting glaciers must surely be high on the list: they move; they transform; they are sensitive to a range of external phenomena; they deliver surprises. They can be equally sentient beings, vanishing water towers or neoliberal instruments.

Arturo Escobar [8] argues that during the last decade, political activation of relational ontologies is expanding in South America. Marisol de la Cadena's ethnographic research documents how in Peru, Ecuador and Bolivia, indigenous popular movements have moved non-human actors—sentient entities that include mountains, water, and soil—into public political arenas (2010). Remarkably, she points out, the 2008 Constitution of Ecuador even gives specific rights to Nature - (*Pachamama*). In what ways, she asks, do 'other-than-human' entities have the potential to disrupt conceptual fields? [9]

The questions that Mark Carey poses in his book will become increasingly important. "Who gets to represent ice"? "Who speaks *for* glaciers?" (p. 149). And why should we assume that science monopolizes this role? The knowledge value of alternative frameworks may become apparent to human dimensions of climate adaptation as we enter times of social and economic uncertainty that will undoubtedly force persons, things and ideas into new and unexpected relationships. Mark Carey's work moves this discussion forward.

[8] Arturo Escobar, 2010. "Latin America at the Crossroads." *Cultural Studies* 24(1)1-65.
[9] Marisol de la Cadena, 2010. Indigenous Cosmopolitics in the Andes: Conceptual Reflections beyond "Politics." *Cultural Anthropology* 25(2):334-370.

Comments by Shawn Van Ausdal, Universidad de los Andes

Who would have thought that a story of melting glaciers would be of much interest? Yet Mark Carey's book, *In the Shadow of Melting Glaciers: Climate Change and Andean Society*, turns the topic into a compelling read. He demonstrates the serious threat posed by glacier retreat in Peru since the 1940s, and shows how efforts to address the problem unleashed a wide range of social dynamics and struggles. His analysis of a society adapting to a warming climate is pertinent in and of itself, but Carey also uses glaciers as a window to examine a wide variety of topics – such as cultural perceptions of nature, the social and economic dimensions of natural disasters, the production of scientific knowledge, and state formation – that will interest environmental historians and many other scholars.

Carey's tale takes place in the Santa River basin, which drains Peru's Cordillera Blanca range into the Pacific Ocean north of Lima, between the 1940s and 1990s. With the end of the Little Ice Age in the late-nineteenth century, the 600 or so glaciers in the Cordillera Blanca (representing about a quarter of the world's tropical glaciers) began melting. As a result, they became increasingly unstable and left an ever-growing number of glacial lakes precariously contained behind moraine dams. Glacier retreat, therefore, created two natural hazards in the region: glacier avalanches and outburst floods (as the moraine dams failed when rockslides and avalanches generated large waves in these lakes). These threats were not just theoretical. A series of floods and avalanches between 1941 and 1970 destroyed various towns and, altogether, took nearly 25,000 lives. Though not well known, glacier retreat has been one of the most deadly kinds of natural disasters in the Western Hemisphere.

As might be imagined, Carey (46) emphasizes the "unnatural nature" of such disasters. His analysis, however, goes beyond just highlighting their social roots and biased consequences. There is some of this, but the floods and avalanches that he examines did not disproportionately affect the poor and other marginal groups. The actual science of climate change and glaciology are also tangential to the story (though the lay reader will learn a bit about glaciers). Instead, the central focus is how Peruvians responded to these tragedies and tried to prevent future ones. It is a story of people trying to make sense of disasters, of efforts to understand their causes and better control the forces of nature, and of the struggles between different actors and the shifting economic and political interests that the disasters themselves set in motion. Carey identifies his grounded and historical analysis of how people experience and manage climate change to be his main contribution. But this is not narrowly conceived in terms of consequences and policy implications. For Carey (6), the "history of climate change and glacier control…is…a history of power struggles, not just between humans and the physical environment, but among various social groups."

One of the admirable aspects of Carey's history is his effort to address local perceptions of and responses to natural disasters and hazards. We learn, for instance, how the mostly peasant (and indigenous) society in this region viewed the glacial lakes as enchanted, potentially dangerous places that needed to be ritually tamed. Embedded in their mythic tales are often surprisingly good explanations of the physical causes of outburst floods. But it was not just peasants who interwove social and natural elements to explain the tragedies. Some regional urbanites viewed the disasters in terms of Nature's retribution for centuries of indigenous subjugation. For urban middle and upper classes more generally, however, the destruction was particularly painful because it threatened the existing social order. Since towns – the symbolic spaces of power and status – were built along the valley bottoms, they tended to bear the brunt of the damage. The powerlessness that urban residents felt in the face of an unruly nature was magnified by their fear of being unable to control the social forces in the countryside as well. The widespread fear that surrounding indigenous communities would begin sacking Huaraz following the 1941 flood prompted authorities to proclaim that they would execute any Indian caught looting. Similarly, various residents blamed the government's land reform program for causing a massive avalanche in 1970. Urban elites read these "natural" disasters through a social lens because they were anxious to preserve key social distinctions (elite vs. peasant, urban vs. rural, white or *mestizo* vs. indigenous) that had already begun to erode, especially as rural-to-urban migration threatened to change urban life and politics.

It was precisely this anxiety that, according to Carey, prompted many urban residents to resist government efforts to rezone or relocate their towns and to insist, instead, on rebuilding them as they had been. They consciously chose to remain in harm's way, in part, to reestablish the social order that had been symbolically transgressed by the natural disasters. The ability of local communities to thwart such government interventions points to the perennial weakness of the state at the local level. It also highlights the importance of local agency, a theme that Carey develops throughout the book. Precisely because urban residents refused to move out of flood or avalanche zones, they had to simultaneously insist that the national government protect their communities by controlling the forces of nature: monitoring and draining glacial lakes and building security dams. Thus, while these communities successfully resisted government attempts at relocation, emphasizing their political autonomy, the ironic consequence of their very success was to make them even more dependent on the national government and its interventions for their future safety, eroding much of that same autonomy.

The production of scientific knowledge is another key theme that runs through the book. Through the mid-twentieth century, metropolitan science paid little attention to localized problems of glacier retreat. Most scientists were interested in the movement of glaciers over millennia and on a continental scale. They also knew much more about the problem of glacier advance than retreat. As a result, Peruvian scientists had to do much of the basic science on their own. They were some of the first, therefore, to link climate change, glacier retreat, and lake formation, as well as

to describe the dynamics of outburst floods. They also developed a classification scheme for predicting glacier stability that remains a powerful tool around the world to this day. And they had to devise and adapt flood prevention schemes, such as lake drainage and dam construction, to the particularly difficult conditions in which they worked. Metropolitan science was not absent, but one of the interesting elements of Carey's story is the local (and tropical) production of scientific knowledge.

Carey also stresses the social context of knowledge production. On the one hand, the advances in Peruvian glaciology were influenced by nonscientific interests. The choice of what glaciers and lakes to study, for instance, had much to do with the political and economic importance of what lay below them. And the focus on disaster prevention cannot be separated from parallel efforts to promote economic development, especially hydropower. (Carey calls this kind of piggybacking "disaster economics.") Thus, as the national interest in energy generation grew, especially from the 1960s, the science shifts to understand glaciers in terms of water management, representing a conceptual turn (for some actors) from hazard to resource. On the other hand, the politics of knowledge is ever present. Different actors and institutions continually struggle to control information related to glacier threat. Particularly significant is the reticence by government and glacier experts to divulge data and threat levels to the public, and the efforts by local communities to contest the government's monopoly on the right to "speak for the ice" (151). Carey also emphasizes the ways in which data collection and processing, mapping and naming, road building and increased government presence brings this region into focus, facilitating the extension of state power and modernity.

While Carey draws connections between his work and a variety of important academic discussions, he also shows the need to explore them in new ways. For instance, while many scholars have rightfully emphasized how marginalized communities are pushed into hazardous areas, his case study examines why relatively privileged groups chose to remain in harm's way. Instead of a story about displaced communities in the name of development or a natural threat, the Peruvian government was rather ineffective in its relocation efforts. As opposed to the imposition of a developmentalist imaginary from without, many locals shared the modernizing ideology of the state, fighting more for their share of the spoils rather than trying the keep the changes at bay. While neoliberalism emasculated the government's disaster prevention program, local political protest and government intervention frustrated the efforts of Duke Energy, the new American owner of the region's hydroelectric plants, from raising production levels by increasing the storage capacity of the glacial lakes.

My only critique is that, at times, Carey seems to lose sight of this kind of nuance. For instance, his explanation of resistance to relocation in terms of reasserting the symbolic dimensions of social and territorial dominance, as well as things like an attachment to place and a reluctance to abandon the dead, is provocative and sounds plausible. But why wouldn't a new town recapture its previous symbolic and

economic importance? It seems to me that the nitty-gritty of how property rights might have been redistributed in a new town merits more discussion in this regard. The effort by the Velasco government in the early 1970s to redistribute property rights in the destroyed sections of Huaraz highlights the ambiguities and tensions that could arise from such a project even if did not have the same transformative intentions. Additionally, I was not completely convinced by the emphasis on the progressive erosion of local autonomy. While such a framework might make sense in terms of the relationship between the national state and local peasant or indigenous communities, it does not seem to work as well with regard to a key set of local actors: urban residents. They likely identified more with Limeños and other outsiders than with the indigenous communities of their own region. And what they longed for was increased ties to the rest of the nation, especially through infrastructure and government services, rather than keeping the outside world at bay. A desire for inclusion and modernization did not mean kowtowing to outside interests, as their constant struggle with the state shows. But the aim of these struggles does not seem rooted in an effort to maintain regional autonomy in the face of expanding state influence. Likewise, it is not entirely clear to what degree the production of knowledge about the area ended up eroding local autonomy. The state and its agents did increase their control of the region's glaciers, lakes, and rivers, and introduced various social and economic changes. But the ability of local communities to reject the government's attempts at hazard zoning suggests that they hadn't lost all that much. To be able to pass judgment on this question, however, we would really need a broader study of the social and political changes that took place in the region than that offered by Carey's glacier-centric narrative. And while Carey notes that the act of geographical naming was rather innocuous– nobody paid much attention to the new nomenclature – it raises the thorny question of the relations between knowledge and power. The two are undoubtedly connected, as Carey eloquently shows. But it is also telling, I think, that the one case in which the national government (the Velasco administration of the early 1970s) forcefully intervened in the region seems to have less to do with the collection and ordering of information than political will and capacity.

Overall, however, Carey has produced a fascinating account of an unlikely but timely topic. The book is well-written and enjoyable to read. Carey provides a surprising amount of detail about the different actors, tragic events, and evolving responses to the threat of environmental change and the dreams of development. He does a remarkable job bringing the story to life without getting bogged down in the minutiae. While at times Carey's effort to contextualize his story within larger academic discussions hints at a degree of insecurity about how much general interest there might be in a social history of glaciers, these connections do show the wider significance of his work. The key strength of the book, though, is its examination of how local communities and a national state in the developing world have experienced and tried to deal with the problem of climate change.

Comments by Eve Buckley, University of Delaware

Mark Carey's *In the Shadow of Melting Glaciers: Climate Change and Andean Society* personalizes global warming, indicating the risks and management challenges faced by communities living on the front lines of climate change. The book focuses on the Cordillera Blanca, the "highest and most glaciated mountain range" in Peru (p. 12). Peru has suffered more glacial disasters in recent history than any other nation. During the twentieth century, warmer temperatures caused glacial retreat, leading at times to avalanches or the overflow of glacial lakes into inhabited valleys below. Carey's text examines the role of state technocrats in managing these disasters while promoting economic development, and also considers local responses to such interference in Andean natural and social landscapes. To tell this story, he has relied on several Peruvian governmental archives, including that of a regional Lakes Commission and a state hydroelectric corporation.

Carey vividly conveys the experience of particular glacial disasters, such as a 1941 lake burst that rushed along a 220 km path, destroying the city of Huaraz and killing five thousand people along the way; and the 1970 avalanche that buried fifteen thousand people in Yungay within moments. Although much of Carey's analysis concerns science and the state, and the tensions between national (or global) and local priorities and perspectives, the concisely narrated disaster stories that frame most chapters are a reminder of what is at stake in climate change and efforts to manage landscapes affected by it. Carey's narrative also provides many evocative descriptions—and very helpful photographs—of the breathtaking yet precarious Cordillera Blanca landscape, which he has clearly grown attached to in the course of his research there.

Carey's analysis of Peruvian scientists' response to the challenges posed by their highland landscape is influenced by Stuart McCook's model of "creole science;" that is, Latin American technocrats' adaptation of research methods and theories from the U.S. and Europe to fit their particular national and regional circumstances and constraints.[10] For the engineers of Ancash, the state where the Cordillera Blanca range is located, surveying and managing shifting glaciers requires innovative and often high-risk endeavors, including high-altitude scuba diving to drain expanding lakes before they overwhelm their moraine or man-made dams.

Paradoxically, glacial retreat increased the appeal and accessibility of the Cordillera Blanca to adventurous tourists. The need to access glacial lakes led the Peruvian government to construct new trails and (sometimes) roads, which allow hikers better transport through the region. Knowing that the glaciers are in decline has heightened their appeal as a hiking destination, reflecting the premium placed by visitors on experiencing ascents and vistas that will not always exist. Observations

[10] Stuart McCook, *States of Nature: Science, Agriculture, and Environment in the Spanish Caribbean, 1760-1940* (Austin: University of Texas Press, 2002).

such as these lead Carey to investigate "disaster economics" throughout the book, which he defines as "the use of catastrophe to promote and empower a range of economic development interests...private or state-owned, planned or unintentional, neoliberal or otherwise" (p. 12). A number of concerns other than safety affected response to disasters by both government bureaucrats and local communities. These included an interest in furthering regional economic development and the frequent resistance by residents to "hazard zoning" when affected areas were rebuilt. In Carey's interpretation, glacial floods and avalanches betrayed the long established social and natural order in which highland and lowland communities and landscapes were understood to be quite separate from each other. Lake bursts reveal the fragility of both economic progress and the social order, sweeping higher altitude debris into valley communities and destroying everything in their path. Overall, Carey finds a strong preference for solving the threat posed by glaciers through engineering, rather than a willingness to adjust lifestyle and residential patterns to accommodate the challenging realities of a warming climate. Ancash residents frequently advocate lake drainage in order to continue living where and as they have been (or even to increase their draw on the area's water resources).

Carey's seven main chapters look at the impact of and responses to specific disasters since 1941, when the flooding of Huaraz led to the first state sponsored studies of glacial science and climate change in Peru. A 1950 flood that destroyed both a rail line and a new hydroelectric dam on the Santa river (part of a TVA-inspired regional development scheme) led to the establishment of a permanent national agency to monitor glacial lakes, the Lakes Commission. Significantly, this intensified state response was spurred by the threat that glaciers posed to industrial progress; their threat to human safety had been established a decade earlier but provoked a less vigorous bureaucratic reaction. State monitoring of the region after 1950 included aerial surveillance, generating a photographic inventory of glacial lakes. However, many of the lakes discovered through this process were nearly inaccessible by road and without a telegraph or telephone link to government centers, making effective management difficult at best.

In Carey's assessment, Lakes Commission activity from the 1950s on—reinforcing moraine dams, or constructing drainage tunnels and canals to guard against overflow—merged "disaster prevention and economic development agendas." (p. 97) At times safety concerns conflicted with development interests, as when lake drainage would diminish hydroelectric projects desired by local industry and residents. In other cases, the two goals worked hand in hand: lake monitoring and maintenance were a source of wage labor, providing increased economic security to local families along with protection from disaster. By the 1970s and beyond, Carey discerns a discursive shift toward viewing glaciers as "water towers," resource reserves available to aid state hydroelectric companies in regulating river volume. These interests trumped disaster prevention concerns, and the use of water for hydroelectric and irrigation projects increased from the 1980s on. Neoliberal ideology of the 1990s under President Fujimori, combined with accusations of corruption and mismanagement at the state hydroelectric company, led to

privatization of Peru's hydroelectric industry—with plants in the Cordillera Blanca region largely owned by U.S.-based Duke Energy. Under this regime, water use for industrial purposes intensified; at times water was even added to previously drained glacial lakes, in order to create reservoirs for increased electrical generation. Carey finds that non-state actors had no legally defined obligation to protect down-river populations from the impact of their lake management—though public protests have at times curtailed hydroelectric companies' plans to alter water flow along the Santa river valley in Ancash. Significantly, Peru's glaciology research office, which had been housed in the state-owned electric utility, closed when that was privatized. It was re-established in 2001 with a skeletal staff, partly due to public panic about the disasters that might result from El Niño and other climate fluctuations.

While I applaud this book's many strengths and the originality of Carey's story, I see need for further elaboration in two areas. First, for readers unfamiliar with the social dynamics of Ancash (or of Peru more generally), it is often unclear who the "local people" are, in terms of class and ethnic identity—or what conflicts may have existed among them. This is particularly true in Carey's provocative analysis of Yungay residents' resistance to "hazard zoning" following the 1970 avalanche (chapter 5). Carey notes that hazard zoning was especially distasteful to wealthy residents, for whom relocation could mean a reduction in social status—largely because higher altitudes had long been associated with politically marginalized indigenous populations. Carey suggests that reformist President Juan Velasco promoted urban reorganization following the avalanche as a way to achieve land redistribution, and thus opponents of his agrarian reform initiatives were opposed to all new zoning measures in Yungay (pp. 132 & 143). "Given that fear of glacier disasters was acute, people's rejection of relocation suggests…that other risks—of losing social status, wealth, or power—ranked higher than the risk of an avalanche or outburst flood," Carey surmises (144). It would be helpful to back this assertion with examples of how a few individuals from different social locations viewed the trade-off between protection from natural disasters and a possible decline in social position (literally and metaphorically). The social significance of residents' geographic location highlights the importance in Ancash of relative wealth and power over other inhabitants. I would have benefited from more discussion of how such local relationships of power worked to produce variable degrees of social and environmental marginality.

My other suggestion is that, based on his analysis of this multifaceted case, Carey articulate a more expansive argument about the interactions between science, states and broader societies in the latter twentieth century—particularly in response to environmental change. In this story, politicians and local residents appeal to scientific authority when it supports their own economic or political agendas. At times, they encourage technocrats to address the glacial threat through engineering even when the scientists themselves have little faith in that possibility. On the other hand, Ancash residents and technical personnel are suspicious of "Limeño" scientists whom they suspect of being unsympathetic to their own concerns. Some

communities rejected the assertions of experts sent by national agencies to monitor glacial lakes, on the assumption that men from the capital were dismissive of highland cultures; instead, these communities preferred to monitor the lakes themselves. In another instance, concerns made public by NASA about the state of Cordillera Blanca lakes, based on ASTER satellite images, were hotly contested by Peruvian scientists as both technically mistaken and a threat to Peruvian tourism. Taken together, the examples of negotiation over scientific data among state and non-state actors in *In the Shadow of Melting Glaciers* present an opportunity for reflection about how such data is generated, interpreted and deployed in high stakes debates about climate change and its impact. As Carey's book persuasively demonstrates, few people understand this better than the citizens of Ancash.

Comments by Gregory Knapp, The University of Texas at Austin

I appreciate the opportunity provided by Jacob Hamblin to review Mark Carey's important book, *In the Shadow of Melting Glaciers: Climate Change and Andean Society*.

This book is a remarkable achievement. It is a product of Carey's extensive doctoral research on Peruvian avalanche hazards at the University of California-Davis. This included both archival and field study at the junction of geography, environmental history, cultural and political ecology, hazards studies, ecological anthropology, and human ecology. Carey's research results have been distilled to fewer than 200 pages (not counting notes and appendices), making it accessible and suitable for a wide audience. I'd compare it to William Cronon's equally concise and accessible *Changes in the Land* for appeal and importance.

The book is an exciting read, and contains numerous engaging stories about different actors and communities and the consequences of their sometimes-inappropriate perspectives about coping with avalanche hazards in the Cordillera Blanca in the Peruvian Andes. Indeed, the book provides a good overview of the adaptive options for dealing with risk, from hazards mapping and settlement zoning, to technological fixes and behavioral adjustments. Although the background to the issues confronting the Cordillera Blanca includes climate change, the book is more focused on dealing with the full range of hazards, and would be important and relevant even if climate change were not occurring. In this respect, it is somewhat curious that the book does not cite the godfather of floodplain hazards research, Gilbert F. White (1911-2006), and the abundant research associated with his tradition. White's fundamental critique of structural (engineering) solutions to flood risks and call for adaptive or planning responses is very relevant here. Perhaps this omission was a decision made in the process of making the book short and concise, but it makes some of the author's points less than clear, as will be outlined below.

Carey documents that there were indeed strong efforts to impose engineering solutions, promoted by both local and national forces. The engineering solutions, including lake modifications, do appear to have been somewhat effective, but Carey points out their limitations (126).

As a curious side note, Berkeley geologist Parker Trask played an early role in arguing for scenic beauty to be a factor in lake management (115), introducing a California wilderness ideal to the Andean environment. Trask's views can be seen as actually be supportive of White's insofar as they imply settlement relocation and adaptation as preferable to technological solutions. Carey's text does not suggest that the wilderness ideal has been much of a factor in recent policy decisions. Indeed, it is remarkable how rapidly aesthetic and ethical concerns in environmental planning have faded worldwide in recent years.

Efforts at planning, including mapping hazards and relocating people from hazard zones, have been vigorously pursued in the Andean setting. The state of Peru played a positive role in creating the Lakes Commission that helped save lives. Authoritarian governments were especially noteworthy in their ability to respond decisively to disasters (193) but there was no single state view (103), and glacier experts were not simply pawns of the state and Velasco (122-123). However, ambitious efforts at relocation have generally not succeeded, in part due to local resistance, attachment to place, and the desire of some to retain social status based on strategic control of resources and prestigious places. In some cases mapping backfired. NASA attempted to demonstrate the technical benefits of remote sensing in order to sell its products, but ended up merely alarming local people (184).

Such critical geographers as Ben Wisner, Christian Brannstrom, and Michael Watts have critiqued Gilbert White's tradition of hazards studies since the 1980's. These scholars have suggested that White may have oversimplified the political economic context of hazards. For them, many poor people have been forced into hazardous environments by factors beyond their control, including unfair and unequal socio-economic systems allied with capitalist development. The poor may even be blamed by elites for environmental problems and risks. These scholars have more recently pointed out that the "neoliberal reforms" of the 1990s may have made hazards worse by eliminating social and political safety nets, privatizing land and water, and promoting export oriented resource extraction and commercial agriculture. Thus, in the Andes there have been strong strides on the study of the impacts of mining, commercial agriculture, and privatization of water by Bury, Bebbington, Perreault, Zimmerer, and many others. In this context Carey's complaint that the empirical study of these impacts is still rare (166) is rapidly being addressed.

Carey's book traces the vicissitudes of Peru's partial and defective implementation of a neoliberal agenda. The closing of glaciology and hydrological resources units in 1996/1997 were clearly a problem (165), and local vulnerability to disasters increased after privatization (186), although these processes had decades of precedent.

The book also touches tangentially on the topic of climate change. Carey points out that glacial melting is not always problematic; melting has actually increased water supply to irrigation and hydroelectric projects, although it is likely that this will eventually decline (163). Glacial expansion (not just contraction) has been associated with disasters in the past.

Carey situates his work as contesting the ideas of at least two groups of theorists.

The first group includes the disaster theorists. It is a bit difficult to tease out from this concise book who Carey means to implicate in this group of scholars who, it is repeatedly argued, failed to see the ability of local people, actors, states, and institutions to have a real, relevant voice in matters of disaster mitigation, response,

and policy, but rather saw the poor as forced into hazardous zones by poverty and racism (44, 123, 145). Footnotes indicate the targets may include such critical "post Gilbert White" geographers as Ben Wisner and Christian Brannstrom, and the numerous calls for what amounts to post critical research seem to be directed at their work. Since Wisner and scholars like him would certainly not want to deny that local actors do have agency, it is a bit difficult to see that the differences are as great as Carey makes out.

The second group of targets is that of the neoliberal theorists.

Since neoliberalism is in effect a term of opprobrium (almost nobody proudly calls himself a neoliberal), it is again unclear which theoreticians are meant to be contested. Perhaps the critique is addressed at the cadre of international (mostly Anglo-American) advisors supposedly responsible for changing Peruvian policy since 1990.

Neoliberal theory is said to not take into account local factors, including the historical background and local opposition to big projects. However, many who promote downsizing the state and expanding free markets are not necessarily comfortable with ignoring local communities or historical patterns. *The Economist* magazine, for example, a defender of market solutions, has been highly critical of Alan Garcia's mining policy insofar as it ran roughshod over local concerns and interests. The process of empowerment of Duke Energy and the privatization of water management can be criticized without necessarily criticizing the general goal of reducing bureaucratic inefficiencies. Indeed, Carey stresses the idea that state and economic development interests can be served while at the same time protecting people (96). Recent research by Ana María Fernández-Maldonado, for example, has also shown that privatization of water and telecommunication services has resulted in both benefits and problems for the urban poor in Lima.[11]

In general, the book is successful in pointing out the dangers of "disaster economics," where technological fixes might generate further problems; it is important to maximize local adaptive capacity to enhance resilience, so local people are empowered to cope with future changes of all kinds. The public relations campaign to involve local people and perspectives in projects has been active, in participatory development terms, since the 1980s. Continual vigilance is required. The World Bank Andean project will depend on understanding local social relations (192).

[11] Ana María Fernández-Maldonado, "Expanding networks for the urban poor: Water and telecommunications services in Lima, Peru," *Geoforum* 39 (2008), 1884-1896 .

Author's Response by Mark Carey, University of Oregon

I am very grateful for this opportunity to engage in interesting and fruitful dialogue about my book with scholars who read it so carefully and critically. I thank all four reviewers—both for the kind words of support for the book and for their insightful comments and points for elaboration. I also want to thank Jake Hamblin for selecting my book for the roundtable review, for overseeing the entire process of commissioning, collecting, and responding to the reviews, and for editing the H-Environment roundtable reviews that enrich environmental history scholarship more broadly.

We all know that environmental history pushes us in interdisciplinary directions, and this book is certainly no exception. The reviews above reveal its cross-disciplinary appeal: though I myself am an historian, the four reviews come from an historian, an anthropologist, and two geographers. These scholars are also specialists of regions outside Peru as well, from Brazil and Canada to Colombia and Ecuador; Gregory Knapp is the only Andeanist per se. Reaching these scholars across diverse fields and specialties—among many others—was precisely my goal in writing the book, and it is gratifying to see here. While the book is about Peru and for Peruvians grappling with the powerful and ongoing effects of global climate change, glacier disasters, and water variability, it is also a case of people's real life experiences grappling with these issues that affect societies on every continent. As such, it is meant to reach audiences elsewhere in Latin America, North America, Europe—and to speak to scholars from the humanities, social sciences, and natural sciences.

Of course this quest to reach diverse audiences raises many challenges. For one, it requires dialogue with the various scholarly literatures that each reader brings to the book. These reviews invoked several different bodies of work. Gregory Knapp asks about the evolution of geography scholarship on floodplain hazards going back to Gilbert White's work that started with his 1942 University of Chicago dissertation on "Human Adjustments to Floods." Julie Cruikshank explains a variety of important works in anthropology about multi-naturalism and ways of incorporating disparate knowledge bases that include diverse, even non-human actors. Eve Buckley asks for broader conclusions about knowledge and science, conclusions that are at the heart of Science and Technology Studies (STS). As each reviewer notes, I engage all of these fields and sub-disciplines. But due to this interdisciplinary nature of the book—not to mention a great deal of discussion on the evolution of glaciology, glacier disaster prevention, and glacial lake engineering, which required learning several scientific literatures—it is difficult to engage all the specific, nuanced debates of everyone's own field. That said, this forum gives me the opportunity to clarify and expand.

Gregory Knapp gave the book a very close reading, and I appreciate both his praise and his thoughtful questions. He asks at the outset about Gilbert White, the

godfather of floodplain hazards research. Indeed, White did revolutionize hazards scholarship, as well as policy. He worked throughout his life on human activities in flood zones, particularly in his hometown of Boulder, Colorado. It was this research that influenced later scholars to conceptualize natural disasters as completely non-natural. This breakthrough in thinking about hazards and disasters was fundamental for hazards research, while his blurring of the boundaries between nature and culture was part of a much larger trend that has more recently culminated in the conception of hybrid natures, social-ecological systems, and coupled natural-human systems. White's arguments also led scholars like Michael Watts to examine vulnerable populations in new ways, by probing the ways in which economic systems, poverty, racism, sexism, and class conflict made marginalized populations more vulnerable than others.[12] This emphasis on the political, economic, and social aspects of vulnerability not only changed disaster scholarship after the 1980s, but also helped Watts and others advance ideas that ultimately figured prominently in the foundation of the field of political ecology. My lack of direct reference to Gilbert White and his legacies for scholars like Michael Watts has more to do with disciplinary styles than with any overlooked intellectual debts. While it is common for geographers to meticulously delineate the decades-long historiographical trajectories that contextualize their work, historians tend to move directly into the historical narrative and/or focus on the most recent scholarship with which they engage, as my book does. It is ironic, I have always thought, that geographers tend to historicize their theoretical frameworks in much more detail than historians do.

But more than just mentioning the historiographical mileposts, Knapp brings up White because he is curious who I "mean to implicate in this group of scholars who, it is repeatedly argued, failed to see the ability of local people, actors, states, and institutions to have a real, relevant voice in matters of disaster mitigation, response, and policy, but rather saw the poor as forced into hazardous zones by poverty and racism." In short, Knapp suggests, rightly I think, that my view of local, vulnerable populations is not that distinct from those of Wisner, Brannstrom, and Watts. But my argument is about giving greater voice to local people in disaster studies. We all agree that while White was correct to insert local populations into the conceptualization of hazard vulnerability and floodplain management, but he also failed to account for complex social, political, economic, and cultural forces that that are now central aspects of disaster studies and fundamental issues in one of the most lively subfields of human geography in the past three decades: political ecology. As I note in the book, groups and individuals exposed and vulnerable to natural hazards do not share power equally, and poor and marginalized populations are often the most vulnerable. In the case of glacier hazards surrounding Peru's Cordillera Blanca, however, the populations most exposed were those who historically were the wealthiest in the region: those inhabiting urban areas adjacent to highland rivers where outburst floods and avalanches flowed and caused most of

[12] See, for example, Michael J. Watts, *Silent Violence: Food, Famine and Peasantry in Northern Nigeria* (Berkeley: University of California Press, 1983).

their damage. On a national scale, as opposed to the region, these exposed populations were not at the top of the socio-economic or political hierarchy, and they thus often found themselves wedged between the national ruling elite on the coast and the much poorer rural population that lived outside the vulnerable urban areas. It is thus only on an international scale, classifying Peru as a relatively poor developing nation compared to, say, the United States or western Europe, when we could classify the populations vulnerable to glacier hazards as the most marginalized. My book thus suggests that future scholarship consider scale, geography, and distinct social groups in relation to others when analyze vulnerability.

Moreover, while none of the researchers Knapp mentions would deny local agency, my quibble—the target Knapp asks me to clarify—is the vast majority of scholarship that tends to conceptualize and frame these local, vulnerable populations as somewhat invisible groups without control of their own destinies. In fact, my precise quibble is evident even in Knapp's very accurate portrayal of this scholarship. He notes that scholars have shown how "many poor people have been forced into hazardous environments by factors beyond their control." He also points out that recent scholarship shows that "'neoliberal reforms' of the 1990s may have made hazards worse by eliminating social and political safety nets, privatizing land and water, and promoting export oriented resource extraction and commercialization of agriculture." I wholeheartedly agree with his assessment of both the scholarship and the historical effects of socio-economic inequality and neoliberalism on societies, as I demonstrate in the book. At the same time, Knapp's summary of the literature turns marginalized populations into passive victims: they were *forced* into situations by factors *beyond their control*, while neoliberal reforms *removed their safety nets*, presumably removed by high level government officials and private entities, not locals. In this framing of the issue, the vulnerable populations themselves have no historical agency. Where are the local voices, local decision-making processes, or local values that do or don't affect their vulnerability to natural hazards? In this framing, where are the multiple local narratives, diverse knowledges, or the multi-naturalism—the concepts Julie Cruikshank addresses above—that underlie diverse actors' perceptions and actions? Are they only forced into these situations by factors beyond their control? Or did they understand and affect the processes that led to their vulnerability over time? In the Cordillera Blanca, local urban residents weighed and ranked many risks, often putting potential glacier disasters as less important than other risks. They also both benefited and suffered as a result of neoliberal reforms, depending on which group in which place and at which time—so on this count I again agree wholeheartedly with Knapp's observation that privatization of water management can have both positive and negative outcomes. Without understanding local actors' own perspectives, however, it might look like vulnerability resulted solely from forces beyond their control, such as national government negligence or neoliberal reforms—neither of which account for local residents own decision-making processes. In my view, there are still far too few studies that put vulnerable voices at the center of the discussion—as my book attempts to do in the relevant sections

or as other books such as John McPhee's *The Control of Nature* on the debris flows in California's San Gabriel mountains, Elena Poniatowska's collection of voices from the 1985 Mexico City earthquake, or Charles Walker's *Shaky Colonialism* on responses to Peru's 1746 earthquake.[13]

In short, there aren't enough ethnographies of the vulnerable, and this is the gripe I try to convey in the book. Even in superb books like Ted Steinberg's *Acts of God* or Eric Klinenberg's *Heat Wave*, the authors emphasize broader patterns of marginalization without much attention to victims' own views. As Steinberg argues, vulnerability to disasters in the history of United States was driven by "politicians; federal, state, and city policymakers; and corporate leaders."[14] Vulnerable populations themselves apparently had no role? In this casting, they become passive victims of corporate greed, negligent states, neoliberal reforms, and class and race divisions—they are statistics in the number dead, injured, or homeless after disasters strike. While these views are essential and accurate, the trouble in my mind is that we don't much understand the decision making of these vulnerable populations or the precise ways in which external forces interact with people's own decision making and their own life histories over time. Even if vulnerable people could not entirely shape their destinies against more powerful actors and forces, it is still important to understand their views and actions—not just to illuminate them but also to better understand causality over time. Doing research for my book, I was surprised to find local urban residents deciding to stay in hazard zones even when they understood the potential for outburst floods and avalanches. What's more, they exercised enough historical agency to reject the hazard zoning plans of experts and the national government. For me, this was a novel breakthrough in how I understood human vulnerability to natural hazards and climate change, as well as regional history in the Peruvian Andes.

This brings me to Eve Buckley's interest in more "examples of how a few individuals from different social locations viewed the trade-off between protection from natural disasters and a possible decline in social position." More broadly, she asks for more contextual details to see "how such local relationships of power worked to produce variable degrees of social and environmental marginality." Shawn Van Ausdal is also seeking more nuance and details in this section. Here they are both referring to my discussion in Chapter 5 of hazard zoning—and local rejection of it—during the 1970s. I provide the broader context and deeper historical issues at play for this period in Chapters 1 and 2. I also decided to reduce details for the 1970s hazard zoning for several other reasons. First, other scholarship by anthropologists Anthony Oliver-Smith and Barbara Bode, who lived in Yungay and Huaraz after the tragic 1970 earthquake and avalanche, examine this period in exquisite detail that

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[13] John McPhee, *The Control of Nature* (New York: Farrar Straus Giroux, 1989); Elena Poniatowska, *Nothing, Nobody: The Voices of the Mexico City Earthquake* (Philadelphia: Temple University Press, 1995); Charles F. Walker, *Shaky Colonialism: The 1746 Earthquake-Tsunami in Lima, Peru, and its Long Aftermath* (Durham, N.C.: Duke University Press, 2008).

[14] Ted Steinberg, *Acts of God: The Unnatural History of Natural Disaster in America* (New York: Oxford University press, 2000), xii.

my book covering 70 years and a host of other topics could not rival. I thus cite the relevant literature for more details. Second, I struggled with sources, as most historians of Latin America do. Much of the information is lost, destroyed, or not catalogued in a way to find it. In some ways, it almost seems more difficult to research twentieth century Peruvian history than the nineteenth century or even the colonial period because post-1950 documents are mostly scattered in the state agencies that created them rather than in central repositories like the national archive or national library. Access thus depends on the decisions and finances of bureaucrats who control the offices or ministries where the material is stored. In many cases, I was unsuccessful in finding the information at all. Sometimes I located it but was refused permission, such as at the Ministry of Energy and Mines. Sometimes the material was there one day, but not the next, such as indigenous community historical land claims that I found one day in the Ministry of Agriculture in Huaraz, but never found again. And in the case of the Ancash regional archive that held a significant amount of material on the early 1970s hazard zoning and land redistribution, the material became inaccessible overnight. I found the archive one day, but when I returned the next day to examine documents, the staff had decided they needed more office space. To double the amount of floor space in the building, they slid half of the gigantic 15 foot-long shelves loaded with documents down the aisles between other shelves. This re-arrangement meant that there were no aisles between shelves, only about 4 inches. I stood tight pressed against the end of the long shelves grasping at the last few documents on each shelf—but only if they were papers because hard cover materials did not bend enough to extract them through the 4 inch gap between shelves. I left frustrated after a few hours, returning a few other times to find the same impenetrable holdings. This explanation of source struggles offers some insights into book production, decision-making about content, and research processes that might be useful to some scholars who have yet to write a book, or to those who have the luxury of working in College Park, Maryland.

Third, and most importantly, I only devoted fifteen pages to 1970s hazard zoning because I was writing a 70 year history of an entire region that sought to put the local people into the story, to explain the historical evolution of glacier science and engineering in their relevant social, political, economic, and cultural contexts, and to chronicle environmental change and glacier disasters over time. Thus, hazard zoning—and hazard zoning in only one short, but influential, period of time—was just one piece of this story. Putting the 1970s into a much longer trajectory of attempted hazard zoning that began in 1941, however, is what I see as one of the strengths of the book. Although some detail is lost for each individual period, it is through the analysis of repeated disasters and responses over time—always in new societal and environmental contexts—that illuminate long-term historical processes at work instead of just reactions to single catastrophes or more present-future analyses of climate change impacts.

Explanations aside, Buckley and Van Ausdal raise important questions about power, knowledge, and social relations. Buckley asks for more explanation of why people made decisions to stay inside hazard zones and examples of residents weighing the

trade-off between natural disaster protection and the maintenance of social position. The book provides a few representative examples of local urban residents deciding to stay inside hazard zones—based on cultural attachment to place; worries they would not be compensated economically for the move; concerns that their cities would lose economic position in the larger Callejón de Huaylas; faith in government engineers to drain glacial lakes before bursting; belief that forces beyond their control (like God or NASA) caused the disasters; fear of upland indigenous populations invading and taking over their urban spaces; and, perhaps most importantly, frustration with President Velasco's authoritarian agenda that wealthy local residents believed would undermine their socio-economic and political authority in the region. All of these reasons and others intersected to inform people's decisions to rebuild their destroyed communities in the same places, which were potentially susceptible to avalanches and glacial lake outburst floods.

One of the principal reasons locals rejected hazard zoning was because they felt it was imposed by the national government. Thus, Van Ausdal's claim that these vulnerable local residents "identified more with Limeños and other outsiders than with indigenous communities in their own region" misses the point, while his contention that "the aim of these struggles does not seem rooted in an effort to maintain regional autonomy in the face of expanding state influence" is quite contrary to the evidence I found and present in the book. In fact, one local resident who I quote (p. 133) complained bitterly about the government's response to the 1970 catastrophe, exclaiming "First the earthquake, then the avalanche, and then . . . the disaster!"[15] In short, this local Yungay resident viewed the perceived social conflict, maldistribution of disaster aid, and governmental failure as more catastrophic than the earthquake and avalanche that killed a staggering 70,000 people in the region. This is in part because the government tried to implement egalitarian principles after the disaster by treating lower and upper class residents the same. This was part of Velasco's broader agenda. But the wealthy victims surrounding the Cordillera Blanca complained that they were more deserving, that they should not stand in line, and that the "Indians" from the heights were invading their former space where the city was destroyed. The urban survivors saw the national government as colluding with the regional poor indigenous classes and eroding urban residents' own socio-economic and political authority. And what made the early 1970s so problematic for them was that, for the first time in their history, the Peruvian government was actively siding with the poor to take their homes, their land, and their urban homeland—the material and representative emblems not only of their day to day lives and communities, but also their social position, their political power over highland and rural populations, their economic standing, their class position, their racial superiority, and their cultural values. As if the earthquake and avalanche had not taken enough, the government attempts at

[15] Quoted in Anthony Oliver-Smith, *The Martyred City: Death and Rebirth in the Andes* (Albuquerque: University of New Mexico Press, 1986), 106 [ellipses represents a pause, not missing words].

hazard zoning also threatened to undermine their social, political, economic, and cultural norms.

These urban elite in the center of numerous Callejón de Huaylas hazard zones were thus under attack from the Peruvian central government, which sought to diminish their social standing and make them more equal to the supposedly inferior indigenous people living outside towns.[16] In contrast to Van Ausdal's claim of supposed camaraderie with coastal populations, many urban survivors saw the national government as power hungry, invasive, and attacking regional autonomy during Velasco's military rule. The key here is to avoid blurring some cultural affinity—in which case Van Ausdal is correct about shared values—with political power and social hierarchies within Peru—in this case the Peruvian context is different than Van Ausdal surmises, especially during the 1970s when Velasco actively sought to reduce regional elite's power. The problem for the wealthier urban populations in the aftermath of the 1970 disaster was both the context of Velasco's specific socio-political agenda and the way the disaster opened up spaces where the socio-economic, race, and class divisions were less clear than previously. Van Ausdal is thus right, I believe, when he notes that "political will and capacity" are among the most important factors. But these must always be contextualized within the specific environmental, social, cultural, political, and economic contexts. As the book explains, responses and perceptions were often quite different in the 1940s, 1970s, and 2000s.

Van Ausdal also asks whether local urban residents' struggles were "rooted in an effort to maintain regional autonomy in the face of expanding state influence." Yes, they were, especially during the 1970s. The national government did increasingly exert control over the region, even if regional groups continued to yield some authority and shaped history. Huascarán National Park was created in 1975, putting most of the glacierized area of the Cordillera Blanca under state management. The state electric company Electroperú increasingly managed Santa River water and some glacial lakes turned into reservoirs. The national government had the authority to turn some of the region's water management over to the US company Duke Energy during neoliberal privatization—and several communities have had bitter conflicts with Duke over water management. And finally, disaster prevention and hazard monitoring under a changing climate and continual glacier retreat has been almost entirely in the hands in the hands of the national government since the 1940s and still today. All of these examples—and there are many more—reveal how knowledge and national government power eroded local autonomy over time. But it is important to remember, as the book argues, that local residents often wanted this national government presence. In contrast to much scholarship on Latin American states, then, this story reveals how people sometimes wanted nation building, though not always and generally on their own terms. These examples should also help clear up Van Ausdal's question about how "the

[16] For more on this, see Barbara Bode, *No Bells to Toll: Destruction and Creation in the Andes* (New York: Paragon House, 1990); Oliver-Smith, *The Martyred City*.

production of knowledge about the area ended up eroding local autonomy," even while it shows Cruikshank's references to diverse narratives and Knapp's point about positive and problematic outcomes of neoliberalism.

As I argue at length in the book, knowledge and power are intimately connected. And environmental forces such as climate, glaciers, floods, and avalanches can have important effects on the production, interpretation, and deployment of that knowledge for political gains. Environmental historians would thus do well to keep focusing their attention on the agency of non-human nature, considering material environments as vital historical actors even if a glacier or river has no intentionality behind its actions. That said, nature is complex and perceptions matter for policies and management. Thus, Cruikshank's explanation of multi-naturalism and diverse narratives should be put in dialectic relations with western science, the state, and a conceptualization of material environments. Putting these forces in *dialogue* over time is what I see as the essence of good environmental history. And as Buckley asks about "a more expansive argument about the interactions between science, states and broader societies," I see this dialogue as a way to integrate STS (especially Actor Network Theory), environmental history, and nation building scholarship (one of the most vibrant literatures for Latin America). Whereas STS pays more attention to knowledge, narrative, and science than environmental historians usually do, STS scholarship often neglects to conceptualize non-human nature as an active historical agent that shapes the past.[17] What I believe my book offers is a case study of historical dialogue between the production and use of knowledges, the ever-changing physical environment, and power dynamics among social groups in response to environmental change and in pursuit of greater control over land, natural resources, and other social groups.

[17] For more on this, see Kristin Asdal, "The Problematic Nature of Nature: The Post-Constructivist Challenge to Environmental History," *History and Theory* 42 (2003): 60-74; Timothy Mitchell, *Rule of Experts: Egypt, Techno-Politics, and Modernity* (Berkeley: University of California Press, 2002); Paul S. Sutter, "Nature's Agents or Agents of Empire? Entomological Workers and Environmental Change during the Construction of the Panama Canal," *Isis* 98 (2007): 724-754.

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