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## The Challenge of Scale in Environmental History: A Small Meditation on a Large Matter<sup>1</sup>



Figure 1:  
Sierra Valdivieso,  
Tierra del Fuego,  
Argentina, 2011.  
Photo courtesy of  
the author.

How do historians balance exceptions against broader patterns to understand their significance? From the perspective of the image above, you can see the rising jagged peaks and the *nothofagus* forests below, but you do not catch a glimpse of the havoc exotic beavers have brought to the water coursing through peat bogs, nor are there indications that this range rises out of an island at the tip of South America. Mountains provide an illustrative way of thinking about historical scale. Setting and serendipity influence inhabiting communities that are molded by barriers and conduits the mountains create. But mountains alone don't explain how beavers ended up in Valdivieso. Mountains shape rather than determine the course of human history, and yet the contiguity of their features opens avenues of comparison, especially regarding time and space.<sup>2</sup> Instead of digging into their strata, let us consider mountains as metaphors for the challenges associated with the multiple levels of analysis an environmental history project might consider.

1 This essay is based on work supported by the US National Science Foundation under grant 1230911.

2 Jon Mathieu, "Long-Term History of Mountains: Southeast Asia and South America Compared," *Environmental History* 18, no. 3 (2013): 557–75.

Some of the most crucial decisions a historian makes to frame a project involve scales. Scale implies a comparison, ordering elements by size, position, population, or more. It also implies a panorama that glimpses each in turn. Historical approaches include provocative conceptualizations, such as borderlands, frontiers, and diasporas, that all invoke scales beyond the ordinary. Attention to the ways in which scale implicitly and explicitly shapes historical work sharpens the exactitude of historical questions without dulling the hatchet needed to cut through insignificance.<sup>3</sup>

Decisions about scale arise in any discipline. In environmental history, scale manifests in at least five ways: temporal, spatial, cultural, organismal, and organizational. In these brief remarks, I take each type in turn, offering unsystematic observations, frequently about Latin America. Too much research slips into easy narratives, seduced by habit and tradition; environmental history offers a promiscuous alternative. By surrendering to an explicit engagement with scale, we might escape to the mountains.

### **Temporal: Timing as Scale**

When to begin? Traditional political or social histories rarely reach back to the formation of the landscape, let alone the shaping of the earth itself.<sup>4</sup> Histories, even of mountain areas, need not begin with tectonic plates, but historians must consider their implicit periodization. We have a more anarchic chronology than, say, geologists, as each historian can decide when to start and stop the story she tells. Historians often develop a timeline based on two or three metrics: an event (the Spanish civil war), a life (or set of lives—Darwin and his contemporaries), or a comfortably round time period (the 1960s or the long nineteenth century). Environmental history's commitment to incorporating nonhuman actors into the story of the human past opens different possibilities. While time is among the most forceful of natural elements, time is also a cultural and philosophical construction. Any segment of time is to some extent arbitrarily defined, even if it ties into daily, seasonal, or planetary

3 Alfred W. Crosby, "The Past and Present of Environmental History," *American Historical Review* 100, no. 4 (1995): 1177–89; Richard White, "The Nationalization of Nature," *Journal of American History* 86, no. 3 (1999): 976–86; Joseph E. Taylor, III, "Boundary Terminology," *Environmental History* 13 (2008): 454–81. For a full explication of the hatchet and seed metaphor, see Paul Robbins, *Political Ecology: A Critical Introduction* (Malden, MA: Blackwell, 2004), 3.

4 David Christian, *Maps of Time: An Introduction to Big History* (Berkeley: University of California Press, 2004).

rhythms.<sup>5</sup> To understand the influence of the past on the present, timescales beyond human construction need consideration. For instance, the life cycle of an *Anopheles* or *Aedes* mosquito is rarely more than a month, yet in their short lives they can impact human well-being through malaria and yellow fever infections. Tiny insects can disrupt human settlement, as they did across the Greater Caribbean, or even play formative roles in human warfare by conferring immunity on some populations or decimating others.<sup>6</sup>

What about the life cycles of plants? In the far western Amazon, near the rise of the Andes, reside stands of bamboo forest with bamboo “trees” (genus *Guadua*) that climb more than 20 meters vertically.<sup>7</sup> These forests cover an area (nearly 180,000 km<sup>2</sup>) three times the size of Costa Rica and dominate the least inhabited tropical areas in the world. Bamboo forests contain a range of compositions including naturally monocultural stands. Knowledge of their existence is relatively new to scientists; these giant stands were only identified by their mystifying appearance on Landsat images as extensive dark yellow patches, distinct from other lowland forests. Perhaps most intriguingly, these forests have a generational life cycle where the entire forest dies approximately every 26 years. What then happens to the animals and possibly even the human populations that inhabit these forests? Timescales of plants and animals matter in human affairs.

Another timescale to consider is the collective impact of humanity on planetary time. Reconceptualizing our current era as the “Anthropocene,” as Noble Prize-winning chemist Paul Crutzen urges us to do, recognizes the interplay between human timescales and cycles of life that existed prior to the overwhelming influence of our species. Dipesh Chakrabarty deepened this observation in relation to history by pointing out the chronological implication that humankind, through the release of carbon gases and industrialization, has become not just a biological force on the planet but a *geological force*.<sup>8</sup> Choosing a timescale and hitching it to a world beyond humans, without being neglectful of human impacts, is a challenge for scaling up environmental history.

5 Adrian Bardon, *A Brief History of the Philosophy of Time* (New York: Oxford University Press, 2013).

6 John McNeil, *Mosquito Empires: Ecology and War in the Greater Caribbean, 1620–1914* (New York: Cambridge University Press, 2010).

7 Miles R. Silman, Emilio J. Ancaya, and James Brinton, “Los bosques de bambú en la Amazonía occidental,” in *Alto Purus: Biodiversidad, Conservación, y Manejo*, ed. Renata Leite Pitman, Nigel Pitman, and Patricia Alvarez (Durham, NC: Center for Tropical Conservation Press, 2003).

8 Dipesh Chakrabarty, “The Climate of History: Four Theses,” *Critical Inquiry* 35 (2009): 197–222.

### **Spatial: Beyond the Nation-State**

Where does history take place? Spatial links, or geographical scale, ground the past in place. The natural features of any environment have influence on human lives, an observation not lost to geographers.<sup>9</sup> Ironically, the social and cultural turn in history unhinged histories of people from their geographical setting to the extent that studies of social relations lost their grounding.<sup>10</sup> Making sure histories take “place” is not as easy as it sounds. Many places—nation-states, for instance—do not exist along ecologically sensible parameters. At least seven nations contain the Alps, nine nations share the Amazon forest, and no less than ten nations, including the world’s newest nation, South Sudan, claim portions of the Nile river. To look at this another way, ecological phenomena both predate and transcend convenient political boundaries.

Costa Rica has a reputation as a peaceful oasis of forward-looking environmental policy. Nearly 25 percent of the territory resides in a national park or other protected area (most countries average around 10 percent).<sup>11</sup> But all of the parks in Costa Rica would fit in a single soybean field in the Brazilian Amazon. In light of this, the challenge for environmental historians is to determine which place-based phenomena might supplement political or cultural frameworks. Then, we must consider how to employ them without losing (or reifying) the meaningful core, the nation-state. The options for spatial supplements abound. Watersheds, mountain ranges, deserts, and oceans form the most convenient of these frameworks: Mediterranean worlds, Andean cultures, trans-Saharan trades, and the Pacific Rim are among the most illustrative. Such place-based, geographical units push considerations of scale beyond expected configurations and open doors through which environmental historians might depart from the nation-state while still retaining meaningful concepts for comparison.

9 The kindred discipline of historical geography has grappled with this for much longer and to several extremes; for an overview see Thomas Lekan and Thomas Zeller, “Region, Scenery, Power: Cultural Landscapes in Environmental History,” in *Oxford Handbook of Environmental History*, ed. Andrew Isenberg, forthcoming.

10 Christopher R. Boyer, *A Land between Waters: Environmental Histories of Modern Mexico* (Tucson: University of Arizona Press, 2012), 1–21.

11 Sterling Evans, *Green Republic: A Conservation History of Costa Rica* (Austin: University of Texas Press, 1999), 1–3. Not all assessments of Costa Rica are positive; for example, see John H. Vandermeer and Ivette Perfecto, *Breakfast of Biodiversity: The Political Ecology of Rain Forest Destruction* (New York: Food First Books, 1995).

### Cultural Scales: Or, Numbers

How to measure culture? Historians are not known for their mathematical prowess, yet in the 1970s and 1980s many influential social historians had a quantitative side.<sup>12</sup> Prosopographies (collective biographies) and quantitative data sets effectively made the case for incorporating the voiceless, the undocumented, the “hidden histories” into larger understandings of societies across time and space.<sup>13</sup> This led in part to new innovations of deep textual analysis and the theoretical tracing of power through the construction of knowledge.<sup>14</sup> One effect was the cultural turn, which set adrift the natural world as just another manifestation of power to be deconstructed, and advocated returning to careful readings of fragmented texts, searching for underrepresented voices.<sup>15</sup> From here, numbers stepped aside as histories from below modified master narratives by reading against the grain. This served as an important corrective, and an expansive view of humanity emerged. And yet the inverse is also apparent. If single, ephemeral glimpses revise our histories, how do we account for overwhelming trends?

Numbers matter, and the ratios and scales of those numbers are relevant, but often tricky, considerations for scholars. Scales of humanity, using raw population numbers, offer a sense of perspective not available elsewhere. In the 1959 introduction to his study of the urban poor in Mexico City, the US anthropologist Oscar Lewis pointed to the irony of his discipline’s predilection for the remote and rare. As a result, he argued, many Americans “know more about the culture of some isolated tribe of New Guinea, with a total population of 500 souls, than about the way of life of millions of villagers in India or Mexico and other underdeveloped nations which are destined to play so crucial a role in the international scene.”<sup>16</sup> Demographic scales should matter in historians’ attempts to account for collective experiences.

12 Peter Novick, *That Noble Dream: The “Objectivity Question” and the American Historical Profession* (New York: Cambridge University Press, 1988).

13 Examples include Roderick Barman and Jean Barman, “The Prosopography of the Brazilian Empire,” *Latin American Research Review* 13, no. 2 (1978): 78–97; T. F. Carney, “Prosopography: Payoffs and Pitfalls,” *Phoenix* 27, no. 2 (1973): 156–179. James Scott’s work popularized the idea of “hidden transcripts”; see *Domination and the Arts of Resistance: The Hidden Transcripts of Subordinate Groups* (New Haven: Yale University Press, 1990).

14 Lara Putnam, “To Study the Fragments/Whole: Microhistory and the Atlantic World,” *Journal of Social History* 39, no. 3 (Spring 2006): 615–30.

15 Michel Foucault, “The Order of Discourse,” inaugural lecture given at the Collège de France on 2 December 1970, in *Untying the Text: A Structural Reader*, ed. Robert Young (London: Routledge, 1981), 48–78.

16 Oscar Lewis, *Five Families: Mexican Case Studies in the Culture of Poverty* (New York: Basic Books, 1959), 1.

Perhaps the best known literary voice from Latin America, Gabriel García Márquez, relied on numbers to make a point in his Nobel Prize for Literature acceptance speech in 1982. His astounding quantitative list condensed unfathomable realities into numbers. Since the 1970s, he explained, “there have been five wars and seventeen military coups. . . . Twenty million Latin American children died before the age of one—more than have been born in Europe since 1970. Those missing because of repression number nearly one hundred and twenty thousand, which is as if no one could account for all the inhabitants of Uppsala.” He continued, “. . . over one hundred thousand [men and women] have lost their lives in three small and stubborn countries of Central America: Nicaragua, El Salvador, and Guatemala. If this had happened in the United States, the corresponding figure would be that of one million six hundred thousand violent deaths in four years.” How revealing that a fiction writer relied upon numerical scale to tell this tale.<sup>17</sup>

García Márquez’s elegance with numbers is matched by a paradox pointed out by the economist Amartya Sen in his poignant analysis of the “100 Million Missing Women.”<sup>18</sup> Sen uses the ratios of women to men in different countries to calculate the deficit of women who would be alive if these women had received similar care as men (thus the title).<sup>19</sup> Using, among other examples, the relative dearth of women in Japan as compared to sub-Saharan Africa, Sen’s point is to push beyond simplistic explanations of culture or economic development to consider a suite of social conditions. Rich and poor, men and women, colonizer and colonized, the stories these numbers tell have a human side and a scale that deepens the context in a way individual narratives cannot.

Numbers also matter to contrasting cultural interpretations. Take, for instance, the popular scientist-turned-historian, Jared Diamond, who uses the encounter between the Spanish and the Incas as not only a thesis-proving anecdote—that guns, germs, and steel explain Western ascension—but also as an illustration for his book’s cover.<sup>20</sup> Diamond asks

17 For this speech, I draw upon Greg Grandin’s inclusion of a larger excerpt in the concluding chapter of his book, *The Last Colonial Massacre: Latin America in the Cold War* (Chicago: University of Chicago Press, 2004), 169.

18 Amartya Sen, “More Than 100 Million Women Are Missing,” *The New York Review of Books* 37, no. 20 (20 December 1990).

19 According to Sen, the ratio in Europe and North America is 1.05 or 1.06 women to men. At birth, there are 105 or 106 male children to every 100 female but biology as a whole favors women, who, when given similar nutrition and general health care, tend to live noticeably longer.

20 Jared Diamond, *Guns, Germs, and Steel: The Fates of Human Societies* (New York: W. W. Norton, 1997).

Historians, anthropologists, and geographers have written many critiques of Diamond; for a few illustrative examples see James M. Blaut, “Environmentalism and Eurocentrism,” *Geographical Review* 89, no. 3 (1999) and Patricia Ann McNany and Norman Yoffee, *Questioning Collapse: Human Resilience, Ecological Vulnerability, and the Aftermath of Empire* (Cambridge and New York: Cambridge University Press, 2010).

how Pizarro's 168 soldiers defeated Atahualpa's 80,000 men. He concludes that disease, technology, and literacy made the difference. Another interpretation might consider the religious reverence for the Inca leader, which paralyzed the soldiers from responding. Culture, in this case, did trump numbers, but what parts of that culture tell the story most fully?

The challenge of scale, then, is to think about ratios as a way of seeing and understanding patterns. Environmental lenses—on germs, on reproductive health, on war—enhance that view. The cultural turn reminds us that numbers alone are not the whole story, but does not advise abandoning proportional considerations altogether. We must think about how culture can sometimes overcome seemingly obvious ratios, thus revealing the unpredictable side of humanity.

### **Organismal: A Scale beyond Us<sup>21</sup>**

What does it mean to take plants, microbes, and nonhuman animals as serious factors in shaping—and being shaped by—human history? The vicuña might help us here. South America has few native ungulate species, but above the tree line in the vast Andean *puna* roams the vicuña, a wild cousin of the llama. Vicuña are the smallest of the camelid species but they have the finest, most exquisite wool in the world that for half a century has fetched prices three to five times the price of cashmere.<sup>22</sup> This characteristic nearly led to their extinction. In the 1960s, the Peruvian government began a conservation program that increased animal numbers from 6,000 to 25,000 in a decade (today they number more than 350,000). A vicuña cannot choose whether the mountains it inhabits reside in Peru, Bolivia, Chile, or Argentina, but the lucky animals in Peru were selected for survival. Environmental history's premise is to take seriously the influence of nonhuman nature on the human story, which means knowing and understanding species beyond our own. To consider other species as actors in history is not to claim their agency; it is to recognize that the human story would be incomplete without them.

21 Paul S. Sutter, "The World with Us: The State of American Environmental History," *Journal of American History* 100, no. 1 (2013): 94–119 and Bron Taylor, "'It's Not All about Us': Reflections on the State of American Environmental History," *Journal of American History* 100, no. 1 (2013), 140–44.

22 Gabriela Lichtenstein, "Vicuña Conservation and Poverty Alleviation? Andean Communities and International Fibre Markets," *International Journal of the Commons* 4, no. 1 (2010), 100–121; Wilfredo Pérez Ruiz, *La saga de la vicuña* (Lima: Diálogo, 1994), 49.



**Figure 2:**  
Vicuña grazing in  
Pampa Galeras Re-  
serve, Ayacucho,  
Peru, 2009. Photo  
courtesy of the  
author.

There is a tension between the various levels at which we can (and cannot) gain knowledge about nonhuman organisms. On the one hand, there are scientific studies of humans' influence on other species and historical studies of the influence of other species on human lives (this influence is particularly strong for microbes, pathogens, and disease vectors). At the same time, there is much we cannot possibly know about other organisms' inner lives or orientations. The challenge for environmental history, then, is to mine the conjuncture between these fields of knowledge. Edmund Russell has recently argued for greater attention to evolutionary history, a field that "studies the ways populations of human beings and other species have shaped each other's traits over time and the significance of those changes for all those populations."<sup>23</sup> Russell points out that evolution is

<sup>23</sup> Edmund Russell, *Evolutionary History: Uniting History and Biology to Understand Life on Earth* (Cambridge and New York: Cambridge University Press, 2011), 5.

ordinary and it happens all around, shaping our lives. What did the cascade of choices in the Andes that nearly extinguished the vicuña mean for this animal or for the people who today purchase \$21,000 jackets made of its wool?<sup>24</sup> At minimum, we know the species are intertwined in complicated ways.

### Organizational: Practical and Political Difficulties



**Figure 3:**  
Road descending  
Andes into Amazon  
basin, Manu Na-  
tional Park, 2011.  
Photo courtesy of  
the author.

Manu National Park, created in 1973 in Peru's western Amazon, is a park known for its biodiversity.<sup>25</sup> Among its quantitative attributes, the park boasts 10 percent of the world's species of birds, 15 percent of its butterflies, and 20 percent of its flora. The key feature of the park that captures this range is the inclusion of a portion of the Andes mountain range in combination with the lowland forest. By stretching up extreme gradients, the park catches a wide range of life forms. But the park also has amazing cultural diversity.

24 David Coggins, "Why Does a Vicuña Jacket Cost \$21,000?," *Wall Street Journal*, 20 September 2013.

25 Manu's size, at 1,716,295 hectares, is equivalent to all of the protected areas in Costa Rica combined.

More than 2,300 known indigenous peoples live within the park, classified in three different categories by the Peruvian government to differentiate their relationship with broader society: native communities, indigenous people (*indígenas*) in initial contact, and native people in voluntary isolation. Small communities of mestizo peoples, many residing in the area since the land grab associated with the rubber boom of the 1890s, inhabit the park's fringes. The park also hosts communities of scientists (especially at Cocha Cashu Biological Station) that live in the forest for months on end and tourists that visit for several weeks. But knowledge is not the only thing extracted from the park, although it is the only legal withdrawal. Loggers, gold miners, hunters, and oil prospectors also seek to appropriate the treasures of the area and often do so clandestinely. The area maintains a national designation as a park, but it has also boasted the transnational moniker, UNESCO World Heritage Site, since 1987.

Which level of authority is the appropriate site to tell the story of Manu's history—native, communal, scientific, economic, national, transnational, global? Although political scales make sense for matters of convenience, their revelatory attributes are more in flux. Many debates between humanist disciplines and the biological or physical sciences hinge on the issue of authority. Who determines the value of a place like Manu—is it the Machiguenga elder who knows the ethnobotanical richness of his heritage or the Western scientist who has used her powers of observation to track the healthy jaguar populations and understand their predatory instincts? To account for these varied perspectives, the challenge is one of scale. It goes beyond size to questions of influence, authority, and ultimately, power. Here, the work of a historian wrapping these perspectives into a single story and bridging competing disciplinary lenses might provide enough context and inspire enough empathy to more fully account for the issues raised by a national park.

### **Conclusion: Towards Scalar Thinking**

There is no single perfect scale; excellent history takes many forms.<sup>26</sup> Historians are lumpers and splitters—perhaps the original data managers. Part of what we do is recycle and repurpose ideas, and part of that involves organizing them to harmonize with

26 Consider the range between Anthony Grafton, *The Footnote: A Curious History* (Harvard University Press, 1999) and Christian, *Maps of Time*.

new insights.<sup>27</sup> The challenge of environmental history becomes selecting multi-scalar categories to draw upon.<sup>28</sup> Fully embracing the challenges of scale gives environmental historians the ability to shift from the microscope to the telescope, and, perhaps most revealingly, to the kaleidoscope. Engaging dilemmas of scale will allow historians to move beyond the habitual and soothing shades of gray or stimulating marginalia to begin asking truly critical questions and writing illuminating comparative work.

The tools to overcome these challenges have never before been sharper or more accessible. Geographical information systems, organizational software, data visualization graphics and more can not only transform how we tell stories; they can shape the very questions we ask. Lest we see the elusive siren of technology as an escape rather than a technique, we must remember that all people do not have equal say in deciding what resources are used in what ways, nor do we have perfect information about the environment to determine the potential ramifications of our actions. Only by understanding how certain people (or species) have been excluded and others overrepresented can we begin to make our narration of the present full of richer choices. There is no one crucial challenge of environmental history, any more than there is one correct response, but I hope more of our conclusions come to consider the scales in which we write.

27 For a thoughtful meditation on recycled ideas, see Jonathan Lethem, "The Ecstasy of Influence: A Plagiarism," *Harper's Magazine*, February 2007, 59–71.

28 Simon A. Levin, "The Problem of Pattern and Scale in Ecology," *Ecology* 73, no. 6 (1992): 1943–67.