Revisiting *Klima*

Author(s): James Rodger Fleming and Vladimir Jankovic

Source: *Osiris*, Vol. 26, No. 1, Klima (2011), pp. 1-15
Published by: The University of Chicago Press on behalf of The History of Science Society
Stable URL: https://www.jstor.org/stable/10.1086/661262
Accessed: 23-01-2025 21:20 UTC

Revisiting *Klima*

by James Rodger Fleming and Vladimir Jankovic*

We have named this volume *Klima.* ("κλίμα period"). This terse but dynamic moniker fits the tone of the contributions, which revive a multivocal and inclusive understanding of a venerable but elusive term. We seek to decouple *Klima* from its current exclusive association with atmospheric sciences and revisit the implications of an ancient vocabulary for medical, geographical, agricultural, economic, racial, and other "endemic" concerns. If climate is not just about the weather, what is it? What does it seek to explain? When is climate invoked? By whom? For what purposes? How are other "key words" linked with it, such as culture, society, civilization, time, and change? In what ways is climate a proxy for other concerns such as regulation, industry, and identity? When is it not an explanation at all? Where is climate incarnated? And how does it matter?

Modern scientific climatology cannot answer these questions. Yet it is burdened with the enormous challenge of delineating how climate relates to social and economic life. This is perhaps inevitable, given that the definition of climate abstracts it from the "lived" experience and constructs it as a derived entity, a statistical index of averaged parameters across space and time. In 1897, the preeminent Austrian meteorologist Julius Hann wrote that "by *climate* we mean the sum total of the meteorological phenomena that characterize the average condition of the atmosphere at any one place on the earth's surface."[1] According to Karl Schneider-Carius, the pioneering weather pilot and meteorologist, "Climatology is concerned with the average states of weather, and the frequency of the different individual types of weather in their geographical distribution."[2] More recently, the World Meteorological Organization defined climate "as the 'average weather,' or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years."[3] In a broader, scientific

* James Rodger Fleming, STS Program, Colby College, 5881 Mayflower Hill, Waterville, ME 04901; jfleming@colby.edu. Vladimir Jankovic, Centre for the History of Science, Technology and Medicine, Simon Building, 2nd floor, University of Manchester, Manchester M13 9PL, U.K.; vladimir.jankovic@manchester.ac.uk. The articles in this volume originated in a conference at Colby College in April 2009 supported by the National Science Foundation under grant no. 0843162. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

[1] Hann, *Handbook of Climatology*, trans. R. deC. Ward (New York, 1903), 1.

[2] Schneider-Carius, *Weather Science, Weather Research: History of Their Problems and Findings from Documents during Three Thousand Years*, trans. National Oceanic and Atmospheric Administration and National Science Foundation (Washington, D.C., 1975), 386.

[3] "Frequently Asked Questions: What is Climate?" World Meteorological Organization Web site, http://www.wmo.int/pages/prog/wcp/ccl/faq/faq_doc_en.html (accessed 25 January 2011); see also Paul Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge, Mass., 2010), xiv.

 0369-7827/11/2011-0001$10.00

sense, climate is understood as the status of the "Earth system" comprising the atmosphere, the hydrosphere, the cryosphere, the upper lithosphere, and the biosphere. Humans too have been granted roles within this nonlinear interacting system, even as human behavior remains resistant to deterministic modeling. With such an expansive vision, it is no surprise that the climatologist C. E. P. Brooks, echoing Rudyard Kipling's "nine and sixty ways of making tribal lays," quipped that "there are at least nine and sixty ways of constructing a theory of climatic change, and there is probably some truth in quite a number of them."[4]

Taking a longer view, however, the definition of climate as a statistical index is an anomaly. The reason is that such a definition is possible only in connection to an instrumental, quantitative, and weather-biased understanding of the atmosphere. Outside this context one is more likely to encounter climate as an agency rather than an index. Climate has more often been defined as what it *does* rather than what it *is*. This means that climate has not usually been seen as an indicator of weather trends, but as a force—and a resource—informing social habits, economic welfare, health, diet, and even the total "energy of nations."[5] In these domains of social life, climate as agency has helped translate matters of concern into matters of fact.[6]

Early modern scholars, for example, considered climate as a biospatial frame of reference to categorize the relationship between life, on the one hand, and atmospheric, hydrological, seismic, and mineral features, on the other. These naturalists viewed climate descriptively as a human experience related to social and natural productions local to a latitude or a tract of land. But they also saw climate prescriptively as the norm that connected environmental features with social potentials. In this sense, climate literally produced seasons and endemic disease, vegetation and diet, soil and vernacular architecture, customs and political organization. Climate was considered an agency organizing social experience as a result of the material circumstances of life.[7] More recently, Andrew Ross underscored this circumstance in relation to climate change politics, writing that climatology, "hitherto considered a second-class adjunct to the more exciting field of meteorology, or at best a branch of physics that had more in common with geography, has seen its object—knowledge about a stable archive of climate statistics—transformed into a volatile, political commodity of the first importance."[8]

CLIMATE ANXIETY

The world's current, some would say unprecedented, state of environmental apprehension is a product of a long historical process that elevated climate science to its privileged position of legitimacy. The global hype about the climatological future

[4] Brooks, *Climate through the Ages: A Study of the Climatic Factors and Their Variations,* 2nd rev. ed. (London, 1949), 7.

[5] See, e.g., Hubert Lamb, "An Approach to the Study of the Development of Climate and Its Impact in Human Affairs," in *Climate and History: Studies in Past Climates and Their Impact on Man*, eds. T. M. L. Wigley, M. J. Ingram, and G. Farmer (Cambridge, 1981), 291–309.

[6] Vladimir Jankovic and Christina Barboza, eds., *Weather, Local Knowledge and Everyday Life* (Rio de Janeiro, 2009).

[7] James Oliver Thomson, *History of Ancient Geography* (Cheshire, Conn., 1948), 106; Karen Ordahl Kupperman, "The Puzzle of the American Climate in the Early Colonial Period," *Amer. Hist. Rev.* 87 (1982): 1262–89; Vladimir Jankovic, "Climates as Commodities: Jean Pierre Purry and the Modelling of the Best Climate on Earth," *Stud. Hist. Phil. Mod. Phys.* 41 (2010): 201–7.

[8] Ross, "Is Global Culture Warming Up?" *Social Text* 28 (1991): 3–30, on 7.

was formulated early by Lord Zuckerman, who, as chief scientific adviser to British prime ministers Edward Heath and Harold Wilson, thought that "man's present political problems are miniscule in relation to what could result from major changes in climate, and someone from outer space viewing our globe . . . could well suppose that nations of today behave like people who quarrel violently and murderously over immediate trivialities on the fiftieth floor of some huge modern Tower of Babel, oblivious of the fact that it is blazing away merrily beneath them."[9] Some claim that global warming was recently "discovered"; others that it was constructed in its current anthropogenic form by methods and agreements over the *longue dureé*. Its history was assembled from privileged positions deemed reliable and authoritative, based on scholarship, data, experiments, models, technologies, and accredited bodies reaching back several centuries. Yet acquiring such knowledge was also unnerving. Meteorologist Jerome Namias observed in 1989 that "the greenhouse effect is now firmly part of our collective angst, along with nuclear winter, asteroid collisions, and other widely bruited global nightmares"; a decade earlier the geographer Yi-Fu Tuan observed in *Landscapes of Fear* that "to apprehend is to risk apprehensiveness. If we did not know so much, we would have less to fear."[10] As descriptive climatology morphed in recent decades into prescriptive climate dynamics, it gained a normative edge that is at once urgent and judgmental. What is to be *done* about climate change? Can climate ever be fully apprehended—or just feared? If the models are accurate, will our choices now somehow determine the course of the next century or even the fate of humanity? A multiplicity of responses looms with dynamic physical, moral, and behavioral factors that baffle even the most sophisticated modelers.

The index- and agency-based readings of "climate" are by no means mutually exclusive, despite the fact that the former has ruled modern science and has become part of folklore. Recently, however, climate as agency has made a spectacular reappearance through the risks associated with ongoing climate change. Climate change is routinely portrayed as something that "impacts" the economy, "affects" countries, "harms" national security, "hurts" the world's poor, and potentially "leads" to global conflict. A recent United Nations Development Programme report calls for a "*fight* against climate change," while the BBC and the British Met Office say that "*tackling* climate change will be one of the most important things this generation does."[11] Climate is clearly not just in metrics—it has become a power to reckon with, generating fortunes or churning out destruction. Recently, it has been repeatedly emphasized that the fate of the planet lies in epochal climacteric (or even climactic) decisions and commitments regarding climate change. This revival of climate as agency makes it a propitious time to examine what this turn of events means in the longer history of constructions of Klima. One way to approach the issue is by scaling it down.

[9] Quoted in Hubert Lamb, *Weather, Climate and Human Affairs* (London, 1982), 4.

[10] Namias, "The Greenhouse Effect as a Symptom of Our Collective Angst," *Oceanus* 32 (1989): 65–7, on 66; Tuan, *Landscapes of Fear* (New York, 1979), 6.

[11] United Nations Development Programme, "Global Human Development Report 2007/2008 Launched in Khartoum: Sudan Reiterates Commitment to Global Fight against Climate Change," press release, January 22, 2008, http://www.sd.undp.org/press%20hdr.htm; Olivier Boucher, "What Is Geoengineering?" UK Met Office Web site, http://www.metoffice.gov.uk/climatechange/science/explained/geoengineering.html (both sites accessed 28 January 2011; emphasis added).

THE CLIMATE OF OPINION NEAR THE GROUND

There is a layer of air within two meters of the ground, the noosphere, that is arguably the most important of all in Earth's atmosphere. It is located in what meteorologists have come to call the troposphere, nestled in the "boundary layer," a turbulent, well-mixed zone at the very base of the sublunar realm. This is a space in which the "natural" atmosphere gets entangled with human energy.

Earth is unique in that it is the only body in the known universe to have such a layer, and the future of the planet will be decided by what transpires in these first two meters. The course and fates of empires begin here, where small disturbances with little initial energy can grow into enormous movements. This is the anthropocentric layer in which we express our opinions, some of which are quickly damped out, while others are recorded for posterity. It is the interdisciplinary sphere of human affairs, the most influential layer of our planet's atmosphere.

This layer has not been fully or even adequately explored, which is unusual, since it is so accessible to us—as intimately close as our next breath. Indeed, it has been consciously excluded from environmental analysis. In the second half of the nineteenth century meteorologists adopted a policy of locating their instruments in shelters two meters above the ground. In an attempt to standardize their measurements and compare measurements over widespread areas, they began to consider the layer of air adjacent to the ground "a zone of disturbance" to be excluded from scientific analysis. This two-meter layer was the location of the killing zone for poison gas attacks during World War I, which was undoubtedly a motivating factor for the German meteorologist Rudolf Geiger, who wrote in 1927 that this zone of disturbance that had been so meticulously avoided in official meteorological observations was important to humans and other living things. He considered it "no longer sufficient" and even "misleading" to focus only on the "large scale climates"— the so-called macroclimates—emphasized by the imperial national services.[12]

Ironically, and despite Geiger's wishes, the zone of disturbance will probably never be fully explored. From the point of view of "synoptic" gaze and global climate, this layer remains "contaminated" and unrepresentative of the processes in the free atmosphere. It does not contain information that could be used for charting a map of continental scale. From the human perspective, however, the layer is inexhaustible in meaning, teeming with change and chance, maintaining its biocentric character over the course of history.

The place of this layer in history and science epitomizes the purpose of this volume. Deeply significant for all human transactions, this layer remains out of sight, its very proximity rendering it invisible. And this invisibility means that the modern sense of "climate" has been eroded to an abstract three-dimensional geophysical *system*, rather than an intimate ground-level *experience*. As a result of this dichotomy, the geophysical reading of climate contrasts with that of climate as constitutive of human affairs—an understanding that has long informed the Western perception of social history. For example, ever since antiquity, climate has been thought of as an element in economic modes of subsistence that, before mass production and division of labor, amounted to optimization of agricultural yield and trade. Such climatol-

[12] Rudolph Geiger, *The Climate Near the Ground*, trans. M. H. Stewart (Cambridge, Mass., 1950), xvii.

ogy attempted to explain why certain species of grain grew in one region rather than another, why a textile was worn here rather than elsewhere, and why agricultural methods yielded better results in one place than in another. Climatic distribution of natural objects and living creatures embodied providential balance in a definitive way: "We learn from experience that no animal nor vegetable is fitted for every climate; and from experience we also learn that there is no animal or vegetable but what is fitted for some climate, where it grows to perfection."[13]

The historical ubiquity of the assumption of causal linkages between bodies and climates, cultures and climates, and natural productions and climates can be seen as an example of what Michel Foucault called a classical episteme. For Foucault, in a classical episteme, adjacency of objects was not a mere "exterior relation between things, but the sign of relationship."[14] Proximity of objects to each other becomes a similitude and similitude becomes a causal connection. Classical geography exemplified this in taking it as an axiom that in any given geographic area, storms, soils, plants, beasts, and humans stood in a causal rather than an accidental relation to each other. They were not simply contiguous to each other, but also co-constituted each other. In other words, when bodies and things were found in a particular place, their very placement became a warrant of ontological affinity between and among them.[15] It was in this context that the scholars of nature working before instrumental climatology argued for an ontological relationship of bodies, races, cultures, and climates.

By the time of far-reaching socioeconomic change in eighteenth-century Europe, early modern naturalists had developed a range of doctrines on how the atmosphere affects human physiology, health, and everyday life. Sociometeorological correspondence spawned an extensive literature on topics covering everything from national characterology, to ambiental medicine, to city planning. Naturalists linked the climate with social welfare and gave an impetus to medical topography, health travel, altitude physiology, eudiometry, and ventilation. Physicians recorded weather to understand epidemics; others asked about the relationship between health and social change in the wake of industrialization; and colonists reported on the physiological effects of the tropics or extreme cold and discussed the climatological reasons behind the moral and political differences of nations. Such richness preceded the modern sense of climatology.[16]

Biocentric and anthropocentric readings of Klima found a champion in the German polymath and naturalist Alexander von Humboldt, for whom the term "climate," taken in its most general sense,

> indicates all the changes in the atmosphere which sensibly affect our organs, as temperature, humidity, variations in the barometrical pressure, the calm state of the air or the action of opposite winds, the amount of electric tension, the purity of the atmosphere or its admixture with more or less noxious gaseous exhalations, and, finally, the degree of ordinary transparency and clearness of the sky, which is not only important with respect to the increased radiation from the Earth, the organic development of plants, and

[13] Lord Kames, *Six Sketches on the History of Man* (Philadelphia, 1776), 4.
[14] Michel Foucault, *The Order of Things* (London, 2004), 20.
[15] Jim Egan, *Authorizing Experience: Refigurations of the Body Politic in Seventeenth-Century New England Writing* (Princeton, N.J., 1999), 16.
[16] Vladimir Jankovic, *Confronting the Climate: British Airs and the Making of Environmental Medicine* (New York, 2010).

> the ripening of fruits, but also with reference to its influence on the feelings and mental condition of men.[17]

This view of climate found support among generations of medical practitioners such as Robert Scoresby Jackson, who extended Humboldt's phenomenology into a demographic vision in which climate was "the sum of all those physical forces which by their operation upon the constitutions of organized beings prohibit their permanent migration from one region of the earth's surface to another."[18] Lions are not found on icebergs; people from the tropics cannot live in Iceland. A decade earlier physician Thomas Burgess asked, "Has not Nature adapted the constitution of man to his hereditary climate? Is it consistent with nature's laws that a person born in England and attacked by consumption can be cured in a foreign climate?"[19] Stable and native climates enabled civilizations; changing and foreign climates disabled them. The historical emergence of societies was synonymous with settlement, and settlement was possible in quasipermanent climates that enabled planning and development.[20] Change of air in general—and change of local climate more specifically—was a subject of great concern among doctors and colonial promoters. What would happen to Protestant bodies in the sultry climates of the Orient? Europeans perceived colonization—which usually required settlers to move to new climatic zones—as a great risk. According to the Abbé Jean-Baptiste Du Bos, French priest and polymath, air that is wholesome to the inhabitants of one country can be a slow poison to strangers. Blood formed by the air and nourishments of Europe was thought incapable of mixing with the air or with the chyle produced by the food of America. According to Montesquieu, countries are cultivated in proportion not to their fertility, but to their liberty.[21]

Such arguments assumed that stable climates guaranteed prosperity, but they also downplayed the importance of climate as a statistics independent of biological and social dimensions. Was there a point of doing science with no use to it? "There is nothing more jejune and uninteresting," argued the London practitioner John Hennen early in the nineteenth century, "than a protracted enumeration of the daily variations of [atmospheric parameters] if the person who describes such occurrences does not deduce from them some practical information."[22] With the rising concerns over industrial pollution, agricultural failures, fluctuations of trade, insurance costs, and energy physics as well as the ice age debates, climate as agency became increasingly pertinent as it seemed to control or at least strongly influence human welfare and

[17] Humboldt, *Cosmos: A Sketch of the Physical Description of the Universe,* vol. 1, trans. E. C. Otté (New York, 1877), 317–8.

[18] Scoresby Jackson, *Medical Climatology or, a Topographical and Meteorological Description of the Localities Resorted to in Winter and Summer by Invalids of Various Classes, Both at Home and Abroad* (London, 1862), 2.

[19] Burgess, "Inutility of Resorting to the Italian Climate for the Cure of Pulmonary Consumption," *Lancet* 55 (1850): 591–4, on 591.

[20] For discussions of climate and social life, see Robert I. Rotberg and Theodore K. Rabb, eds., *Climate and History: Studies in Interdisciplinary History* (Princeton, N.J., 1981); Wigley, Ingram, and Farmer, *Climate and History* (cit. n. 5); J. D. Post, *The Last Great Subsistence Crisis in the Western World* (Baltimore, 1977); Robert Claiborne, *Climate, Man and History* (New York, 1970); Franklin Thomas, *The Environmental Basis of Society* (New York, 1925).

[21] Montesquieu, *Spirit of Laws* (1748), book 18, C 3.

[22] Hennen, *Sketches of the Medical Topography of the Mediterranean Comprising an Account of Gibraltar, the Ionian Islands and Malta* (London, 1830), xvi.

economic growth—even evolution. In 1880, an American lawyer considered climatology a science of "ventilation and hygiene" and predicted that governments would become obliged to protect the climatological rights of their subjects, using state institutions to procure "to every citizen the needful amount of pure air."[23] In England Robert Angus Smith unwittingly worked on one such project when he used "chemical climatology" to collaborate with manufacturers in curbing emissions in a way that would raise the productivity and profits of the emitters. His fellow Mancunian William Stanley Jevons wrote in 1866 on the impact of outdoor and leisure markets on the autumnal trends in the Bank of England's decisions to raise interest rates.[24]

Clearly, climate is not just an index of the average weather. Both climatologists and the general public have come to think of it as a sort of "mechanism" with major implications for life in modern times.[25] The characterization of climate as either enabling or disabling was relevant especially among the generations struck by the increasing complexity of social, political, and economic transactions, together with the expanding dependence of everyday work on technological systems and natural resources. The infrastructural interdependencies required by the energy-based economies produced new vulnerabilities and new risks.

"Governments and universities should devote meteorology and economic statistics funds for research on the same scale as those devoted to astronomy, geology, physics and chemistry," agued H. Stanley Jevons, William's son. "Knowledge of the weather cycles and their correlation with crop cycles in different countries would also be of great value to economists, as the foundation of an intensive statistical investigation of industrial fluctuations."[26] In the United States climatologist Helmut Landsberg, whose broad-ranging interests linked atmospheric and social phenomena, argued in 1946 that American climates should be seen as a "friendly element" to be tapped for national benefits: "They constitute, if properly exploited, a very important natural resource."[27] The deliberate "uses" of climate would cut expenditures in housing, heating, airports, "all-weather" highways, dam construction, flood control, and wind power. In Landsberg's terms, these were all parts of "the exploitation of climatic income." Soon after becoming the chief of the U.S. Weather Bureau, F. W. Reichelderfer claimed that weather information accounted for savings and profits of more than $3 billion annually. He added that "permanent changes in climate could bring ruin to our entire business structure [in which] two million businessmen every morning turn at once to the weather report, [and] more than a million listen to the weather forecast by radio once or more each day."[28] Now, entrepreneurs are headed to the bank to cash in profits from their environmental accounting schemes to avoid climate change.

Reichelderfer's concern continued to inform the perception of short-term climate change as disabling especially after the 1970s, a decade marked by extraordinarily adverse weather events linked to economic downturn. Hubert Lamb's book *Climate,*

[23] Britton Armstrong Hill, *Liberty and Law,* 2nd ed. (St. Louis, 1880), 67.

[24] R. Angus Smith, *Air and Rain: The Beginnings of a Chemical Climatology* (London, 1872); Jevons, "On the Frequent Autumnal Pressure in the Money Market and the Action of the Bank of England," *Journal of the Statistical Society of London* 29 (1866): 235–53.

[25] E.g., Joseph Fletcher, "Polar Ice and the Global Climate Machine," *Bull. Atom. Sci.*, December 1970, 40–7; and four decades later, Edwards, *Vast Machine* (cit. n. 3).

[26] H. Stanley Jevons, *The British Coal Trade* (London, 1915), 581.

[27] Landsberg, "Climate as a Natural Resource," *Scientific Monthly* 63 (1946): 293–8, on 293.

[28] F. W. Reichelderfer, "The How and Why of Weather Knowledge," in *Climate and Man: Yearbook of Agriculture 1941*, U.S. Department of Agriculture (Washington, D.C., 1941), 128–53, on 128.

History and the Modern World (1982) summarized this in a discussion of the "experience of 1972," during which the extraordinary heat and drought in Russia, China, India, and Australia caused grain shortages leading to massive death and migration southward. Coffee harvests dropped in Ethiopia, Kenya, and Ivory Coast, and El Niño ruined anchovy fisheries in Peru and Ecuador. The net effect was the first drop in the world's total food production since 1945. Lamb thought that among "the leading scientific, technical and administrative institutions in the advanced countries, there was some confusion about how to interpret the climatic event and revise attitude to climate, even before the anxieties aroused by the unprecedented international economic crisis, which began to develop with the first (fourfold) oil price increase in 1973-4."[29] Which aspects of the crises of 1972 were short-lived, and which were the signals of longer-term trends? Was the crisis caused by or only precipitated by seasonal anomalies? An international workshop on climate issues reported that it was "exceedingly difficult to extract the climatic 'signal' from the 'noise' induced by other factors. . . . In 1972, for example, the effects of a series of climatic anomalies were greatly magnified by other factors to produce among other things unusually large changes in the world food prices."[30]

By the early twentieth century, recognition of emergent vulnerabilities informed bioclimatology and urban climatology. Bioclimatology grew out of medical, agricultural, and geographic attempts to understand the relationship between life and the "geographical envelope" on a comprehensive level. Working within this tradition, German physiologist Adolf Loewy in 1924 defined climate as "the sum of all the atmospheric and terrestrial conditions, typical of a place, by which our state is directly influenced."[31] The centrality of human experience of climate and the treatment of climate as agency evolved also with the growth of urban climatology and the research in *Kleinklima* as a response to concerns over industrial hygiene and residential quality of life. Early studies by Luke Howard, Emilien Renou, and August Schmaus reported the existence of urban heat islands, followed by the microclimatology of built spaces.[32] On a hot July day in 1934, U.S. Weather Bureau chief Willis R. Gregg, presiding over the dedication ceremonies at the air-conditioned house at the Century of Progress world's fair in Chicago, announced that there was "no longer any need for suffering from weather discomforts."[33] Yet now is the season of our climate discontent.

In a recent interview, the French art critic Jean Christophe Royoux and the German philosopher and media theorist Peter Sloterdijk exchanged ideas about, among other things, Sloterdijk's recent thinking about (atmo)spheres as a metaphysical concept of existence. Sloterdijk at one point digresses to say that "air has always been a medium that allowed humans to realize the fact that they're always already immersed in something almost imperceptible and yet very real, and that this space of immersion dominates the changing sites of the soul down to its most intimate modifications. Ventila-

[29] Hubert Lamb, *Climate, History and the Modern World* (New York, 1982), 307.

[30] International Workshop on Climate Issues, *International Perspectives on the Study of Climate and Society* (Washington, D.C., 1978), 68.

[31] Quoted in Schneider-Carius, *Weather Science* (cit. n. 2), 389.

[32] Helmut Landsberg, *Physical Climatology* (State College, Pa., 1941); Landsberg, *The Urban Climate* (New York, 1981); Michael Hebbert and Vladimir Jankovic, "Hidden Climate Change: Urban Meteorology and the Scales of Real Weather," *Climatic Change* (forthcoming, 2011).

[33] Quoted in James Rodger Fleming, *Fixing the Sky: The Checkered History of Weather and Climate Control* (New York, 2010), 133.

tion is the profound secret of existence." Sloterdijk considers early twentieth-century gas warfare as the perversion of military art, in which for the first time on such a scale, political leaders condoned a lethal manipulation of the atmosphere and the type of warfare that "no longer kills by direct fire but by destroying the environment. The art of killing the environment is one of the big ideas of modern civilization. It contains the nucleus of contemporary terror: to attack not the isolated body of the adversary, but the body in its Umwelt."[34]

World War I was dominated by the crushing realities of trench warfare and the controlling influence of Generals "Mud" and "Winter." This, however, did not dampen the enthusiasm of promoters such as Alexander McAdie, head of the new Aviation Weather Advisory Service of the U.S. Navy, who crowed, "Who commands the air, commands all! . . . Henceforth the ships of the sky shall play the leading role, and the nation holding the mastery of the air will have in its palm the power to make or mar. . . . The strategies of warfare will be entirely different. Individuals will count for less; machines and *weather* will determine the victory."[35] Saturation bombing of civilian targets and the nuclear annihilation of Hiroshima and Nagasaki were one generation away. When control of weather and even climate emerged as a distinct possibility following World War II, General George C. Kenney, commander of the Strategic Air Command, announced, "The nation which first learns to plot the paths of air masses accurately and learns to control the time and place of precipitation will dominate the globe."[36] Such attitudes led to an all-out military effort in the atmospheric sciences and to secret cloud-seeding efforts in the jungles over North and South Vietnam, Laos, and Cambodia. In the twenty-first century, who is to say that the military will not be centrally engaged in climate change issues and climate control efforts, especially if environmental degradation triggers concerns about national sovereignty and security?[37]

All these approaches are important, but unprecedented, aspects of climate history. The themes are many, but the workers are, as yet, few. We argue that, historically speaking, climate discourse cannot be understood without paying tribute to a more inclusive—and a less reductionist—perception of geophysical reality, which we have tried to capture in the classical (later traditional) concept of Klima. The articles in this collection demonstrate the importance of this wider perception in describing the complex and elusive character of environmental thinking from the early modern era until the most recent efforts to model climate change. If there is a single common theme underlying our collection, it is a view of climate as a framing device in which the verities of life such as food, health, wars, housing, economy, social movement, or local identity change synchronically with Klima. Regardless of whether such domains can be shown to depend on atmospheric events, geophysical processes, human perceptions, or something yet more elusive, they have routinely been framed as if they did. Racial and mental differences, whether or not they may be shown to derive

[34] Peter Sloterdijk, "Foreword to the Theory of Spheres," available on the Web site of the Manchester Architecture Research Centre, University of Manchester, http://www.sed.manchester.ac.uk/research/marc/news/seminars/latour/COSMOGRAM-INTER-GB_Spheres.pdf (accessed 30 January 2011).

[35] McAdie, "War Weather Vignettes," in *Alexander McAdie: Scientist and Writer*, comp. Mary R. B. McAdie (Charlottesville, Va., 1949), 296, 261; "Making the Weather," ibid., 325–6 (emphasis in the original).

[36] Frank L. Kluckhohns, "$28,000,000 Urged to Support M.I.T.," *New York Times*, June 15, 1947, 46.

[37] Fleming, *Fixing the Sky* (cit. n. 33).

from climatic differences, have been discussed as if they did. Military success and political arrangements have been and continue to be related to adaptation to particular climates. We believe that the importance of articles in this volume lies in recognizing that such claims have informed climatological thinking throughout history. As editors we feel privileged to bring attention to the richness of climate discourse, which is further buttressed by the richness of approaches presented here. *Klima* is thus an attempt to resurrect the many meanings of atmospheric environment through the different modalities of scholarship: from environmental history to intellectual biography, from history of science to historical geography, from the analysis of field notes and correspondence, through discursive and conceptual engagements, to studies of networks, places, and regions. If it serves to vex a more simplistic recent set of assumptions about climate, so be it; for the risks of not reading history are great.

CLIMATES INCARNATE

The incarnation of climate as social truth is one of the motivating themes in the contributions that follow. But so is the dialectic opposite of this process. Regardless of the time period or the concern at hand, the authors here demonstrate that social issues can be incarnated as natural threats. Climate is a discursive vehicle capable of naturalizing matters of social concern into matters of natural fact. Studying climatology is always about studying society, vicariously or not. While remaining a highly complex physical science, climatology has virtually always turned into a performative entity. Especially in the public realm and in current decision making, climate is made to perform acts of immense political magnitude and economic consequence. In these realms, climate has been clearly emancipated to become a fulcrum of social action.

Section 1: Natural Laboratories

We have divided the volume into four sections. In the first section, "Natural Laboratories," we include the articles dealing with the historical circumstances that gave rise to the complexities of modern climate discourse. We open with the contributions by Gregory Cushman, Deborah Coen, Sverker Sörlin, and Ruth Morgan because they share a common interest in exploring the intersections of knowledge and politics, space and concepts, experience and theory. They look at "natural laboratories" as sites of the production of climate knowledge: a Peruvian lake (Cushman), Turkestani steppes (Coen), Greenland glaciers (Sörlin), and Australian deserts (Morgan). These articles are clear about the varied mechanisms of coproduction of climate knowledge between naturalists, authorities, and local publics. They highlight the relevance of first-hand involvement with the materiality of climatic zones and geological features. They lead us to recognize that climatological ideas often derive from both somatic and social encounters with airs, waters, and places and depend on the ability of practitioners to extend and expand limited, partial, and small-scale data into general "truths" of climatology. Importantly, these articles reveal that the political meanings of climate and its social implications are due to the fact that the concept itself refers to a hybrid realm comprising land, water, air, living beings, people, and cultural institutions. Klima, in this sense, is paradigmatic in its binding of culture and nature that represents civilization as a result of materiality, contingency, and particularity of place. Climate discourse is environmentalism before there was an environment.

More specifically, Cushman discusses the political epistemology of climatic change stemming from land use and deforestation. His contribution demonstrates that the popularization of the modern belief that land use changed climate can be traced to Alexander von Humboldt's treatment of the Lake Valencia Basin in Venezuela and the desert coast of Peru. Cushman portrays these places as "natural laboratories" and sites of contact between geophysical and cultural agencies. In particular, he points out that Humboldt's treatment (and use) of desertification and climatic change drew heavily on his political stances against colonialism and plantation slavery. Such and similar preconceptions have long influenced how individuals and communities imagined their place within the climatic belts of Earth. Where Humboldt might have deplored the climatic effects of slavery, his contemporaries might have understood slavery as a necessary form of production in the tropics. Scholars and laypeople alike perpetuated anthropological and racial stereotypes about the "torrid zone." Coen further addresses the construction of regional climates in her account of Austrian scientists working on the spatial differentiation of climate as an element in regional economics. Imperial climatographers described regional climate in relation to human life, stressing its relationship with vegetation, agriculture, industry, and human settlements. The mountain climatology of Heinrich von Ficker and A. I. Voeikov, Coen argues, conformed to the patterns of the continental-imperial science of "regionalization" and thus embodied the (syn)optics and priorities of Austrian geographic identity early in the twentieth century.

Sörlin looks in more detail at the work of Swedish glaciologist and policy adviser Hans Ahlmann, author of the "polar warming theory." Sörlin interprets the career of Ahlmann's theory as an epitome of its author's idea that fieldwork should be conceived as a form of laboratory procedure involving networked data gathering and quantifiable demonstration. Ahlmann's ideas can be exemplified in what Sörlin calls the "instrumented glacier," combining the subject of investigation, the instrumental infrastructure, and the community of investigators and local informers. Morgan provides extraordinary evidence that the growth of scientific interest in the rainfall of the Southwest region of Western Australia during the twentieth century was "strongly influenced" by political, social, and economic concerns. Morgan provides an account of how, more recently, climate science became deeply enmeshed with party politics when the Labor Party took to market its green credentials, leading to the government's decision to link support for national research to the implications of the greenhouse effect. Climate science cannot be divested from the circumstances surrounding its production, as regionalism, cultural difference, and local senses of belonging define vectors of research and even the basic meaning of climate.

Section 2: Social Contexts

These issues lead to our second section, "Social Contexts." Rethinking climate in light of its meanings in social contexts takes us further away from its indexical status as an average. Memory, local knowledge, and expectations about physical surroundings have played important roles in thinking about climates, stable or otherwise. In this section, Brant Vogel, Mark Carey, and Georgina Endfield engage with the past tropes, stereotypes, and values at work in shaping the "climate dimension" of cultural experience. What did it mean to say that climate was

"wholesome," or "enervating" or "enfeebling," as was often the jargon of colonial naturalists? And what sort of relationship could there be between climate and national identity? What did it mean to argue that a climate was changing at a time when there were no reliable measurements of meteorological trends, local or global?

The chronic difficulties in providing reliable explanations of climatic patterns and the fears surrounding their future have defined the status of climatology as science. At dynamic historical junctures in eras other than our own, when human activities appeared so intensive as to encroach on providential order, concerns about the climatic outcomes gave rise to discussions on "anthropogenic climate change."[38] Vogel shows that such discussions thrived even in the early modern period, when British and American observers argued over how a reported warming trend corresponded with the issues of land management and colonial enterprise. Following the arguments in an anonymous letter from Dublin, Vogel finds that the author's doubts as to the cause of the reported warming made him an advocate of instrumental series of measurements, which he hoped would decide the issue. For Carey, such views informed nineteenth-century medical climatology that brought to attention unfamiliar pathologies in non-European latitudes. Carey, however, detects a substantial change in the perceptions of the Caribbean climate, from unhealthy to bracing, and follows the change in the writings of contemporary physicians, residents, state officials, travelers, and missionaries. The emerging paradisiacal image of the Caribbean did not result from a "rational" discovery of its healthiness but from an assemblage of interests, Carey explains, negotiated among groups such as tourist and transport organizations. The global swell of mass tourism testified to, among other things, a rapid increase in the disposable income of (mostly) the European and North American industrial bourgeoisie. Endfield's treatment of the work of British climatologist and geographer Gordon Manley demonstrates the real possibility to "reculture climate change discourses" by alerting us to his association of weather with people, spaces, and places. Endfield argues that Manley understood climate to be both culturally and spatially variable, layered with meaning and linked to cultural habitus.

Section 3: International to Global

In our penultimate section, "International to Global," we move toward more recent developments in the science of climate change as an anthropogenic phenomenon. European and American industrialization, the growth of megacities, and the social problems that came in their wake made many recognize that the environmental footprint of growth may well turn out to be the farthest reaching in its global consequences, not least in its effect on climatic patterns. Interest in gas physics and in the atmospheric changes due to industrial emissions was accordingly on the rise in the early decades of the twentieth century. The insights of Svante Arrhenius and Guy Stewart Callendar's visionary claims about the relationship between the observed global temperature rise and carbon dioxide emissions were followed, by the 1950s, with more orchestrated and better funded research into the problem of anthropogenic

[38] James Rodger Fleming, *Historical Perspectives on Climate Change* (New York, 1998).

climate change.[39] But while the main protagonists of this research in the Anglophone world are well known and written about, the non-English-speaking world has not received enough attention. Maria Bohn redresses this through a fresh assessment of the work of Swedish climatologists. Bohn looks at the longer history of carbon dioxide measurements in Scandinavia and the Arctic before the Mauna Loa series, showing that the reasons why Swedish protagonists undertook them in the mid-1950s had to do more with local agendas than with the idea of testing the "greenhouse effect" hypothesis.

Adrian Howkins shows in his account of the climatology of Antarctica after the International Geophysical Year of 1957–8 that, regardless of scientific dimensions, the threat of climate change in Antarctica was politically opportune in reinforcing the great powers' exclusive domination in the territorial politics of the continent. Symptomatically, however, the political opportunity was so alluring that it stifled a fair assessment of scientific results and allowed for simplified interpretations and reductionist narratives. The politicization of climate discourse is further echoed in the contribution of Matthias Dörries, who underscores the need to pay more attention to climate change as a military defense entity whose imagery of "nuclear winter" penetrated deeply into the imagination of leading scientists and public figures. Whichever way one looked, "doing atmospheric research *was* politics," if for no other reason than because the consequences of a nuclear war could well mean the end of politics as the world knew it. Samuel Randalls argues for the importance of social science histories of climate change and presents an account of the role economics plays (or does not play) in the genre of contemporary science-policy histories of climate change. His focus is on how cost-benefit analysis from the 1970s to 1990s, as practiced by William Nordhaus and others, subtly altered debates about climate policy as heuristic economic models took on a prescriptive status.

Section 4: **Klima** *Redux*

In the postscript to the volume, Mike Hulme directly addresses the perennial issue of climatic determinism, marginalized in the first half of the twentieth century, yet resurgent in the twenty-first century as heightened anxieties about changes in climate and the hegemony of climate models foster a new "climate reductionism" regarding society and the future. Hulme argues that climate reductionism is exercised through "epistemological slippage," in which predictive authority is transferred from one domain of knowledge (physical climatology) to another (social science) without appropriate theoretical or analytical justification. The immense role of climate as a trope shaping communal perceptions has left an imprint on the science of climatology. Climatology is sometimes hailed as a tool for thinking about our future. But is it the only available expertise for the diagnosis, prognosis, and cure of the climate crunch? Climatology has taken the form of a planetary medicine: what the medical sciences do for the sick body, climatological knowledge can do for the sick planet. As a result of this repositioning, climatological modeling has ceased to act as a mere form of

[39] James Rodger Fleming, *The Callendar Effect: The Life and Work of Guy Stewart Callendar (1898–1964)* (Boston, 2007); Spencer Weart, *The Discovery of Global Warming* (Cambridge, Mass., 2003).

expertise and has become a normative, value-laden instrument for assessing the fate of economic and social worlds.

CLIMATE MATTERS

"Climate is a rather elusive entity," wrote Landsberg in 1950, as he sorted out some twenty or so competing definitions.[40] He went on to note that the greatest puzzle of climatology is why and how climates have changed (and will change). In addition to various physical and geographical approaches, climatologists framed their discourse as commensurable with political, ethical, and other master narratives. In the literature, as if counterpoised on a conceptual seesaw, the nebulous, portentous (some would say pretentious) concept of climate is paired by many authors with such macroconcepts as culture, society, civilization, time, life, literature, war, cosmology, evolution, comfort, diseases, landscape, architecture, capitalism, global survival, the British scene, and the energy of nations.

If the atmosphere—as a medium that shapes life in a most fundamental and most dramatic way—can no longer exist outside human past and future, we also suggest that climate, as a framework of the material possibilities of life, can no longer exist outside the temporality of the social world. Historically speaking, it is no longer viable to think of climate as a subject of climate science only, no matter how one wishes to define it or practice it. Reducing climate to climatology is like reducing language to linguistics. We rather speak of climate discourse as one of the historically evolving (perhaps devolving) frameworks of possibilities by means of which societies make explicit their experiences of a special kind of *Umwelt:* one enframed by the forces of latitude, season, weather, illnesses, clothing, housing, diet, status, and social class. For us, climate *discourse*—not to be reduced to climate *science*—is a framing device that makes explicit all social concerns arising from anxiety over the sensible and latent experiences of living in an atmosphere of hunger and satiation, disease and health, poverty and wealth, isolation and community, angst and hope.

We hope that the lesson to be taken away from this volume is not just about the role of "climate" in the narratives of risks associated with environmental contingency. While we recognize that Klima is a strange attractor of fears arising from the uncertainties of Earth's pulse, we also note that it has as frequently been a detractor in cases when human responsibility was the only explanation of social distress. To say that climate explains the shape of material and spiritual life would be to give it an undue prominence on the stage of history. When and where this has been done, climate was used as a subterfuge for social ills, especially at times when the complexities of social fabric exceeded human understanding or when the reality was too grim for acceptance of responsibility. Thus it sometimes seems more logical, as emerging planetary surgeons argue, to "fix" the sky technologically rather than address social ills, or to justify imperialism as a form of civilizing process by a race nurtured by bracing northern climates. Issues like famines and "climate refugees" are often much too complex to be thought of as a result of physical circumstances only.[41] Yet they

[40] Helmut Landsberg, "Climatic Analysis and Climatic Classifications," seminar talk before the Geophysical Research Directorate, Air Materiel Command, August 4, 1950, Helmut Landsberg Papers, University of Maryland, College Park.

[41] Mike Davis, *Late Victorian Holocausts* (London, 2000).

are sometimes reduced to geophysical systems and made amenable to disinterested scientific inquiry.

The articles presented here epitomize a historical agenda to problematize knowledge claims, particularize climatic experience, and pluralize the meanings of climatological expertise.[42] The subject is venerable, but we have only just begun to explore its rich historical complexity.

[42] David N. Livingstone, commentary, "Cultural Spaces of Climate" session, Royal Geographical Society annual meeting, Manchester, August 2009.