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Volume 2

Edited by
Joseph P. Stoltman
Western Michigan University

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FOR INFORMATION:

SAGE Publications, Inc.
2455 Teller Road
Thousand Oaks, California 91320
E-mail: order@sagepub.com

SAGE Publications Ltd.
1 Oliver's Yard
55 City Road
London EC1Y 1SP
United Kingdom

SAGE Publications India Pvt. Ltd.
B 1/I 1 Mohan Cooperative Industrial Area
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Social Constructions of the Environment

Kevin Archer
University of South Florida

The variable relationship between humans and their environments is a major tradition within the discipline of geography. At various times in the past, this relationship has been considered by geographers and by others to be deterministic, that is, the idea that, if researchers know enough about a particular localized environment, they can be pretty certain about how humans behave there. Or, from the opposite angle, if researchers know enough about how humans behave, they can predict how they will interact with their local environment. Such determinism eventually gave way to a more probabilistic understanding of this relationship between humans and their environments in which some uncertainty is involved, necessitating a much more qualified theoretical stance on the matter and, for many geographers, a more empirical approach for ultimate resolution.

Geography is the original environmental science in this regard, but one that continues to differ from most other, more recently established environmental disciplines. These latter disciplines either put too much emphasis on the natural environment, to the neglect of the social, or too much emphasis on the social, to the neglect of the natural environment. In contrast, geographers try to maintain focus on both the natural and social environments in their attempt to explain rather than merely describe variations in the human–environmental relationship across the planet. Environmental issues, in this view, are always combining social and natural phenomena, neither wholly natural nor wholly social in origin or substance. Thus, environmental issues, problems, and conditions should be studied as such if they are to be successfully identified, analyzed, and resolved.

These assertions concerning geography provide a first approach to the topic of this chapter. After all, to most people, and even to most environmental scientists, the notion of social constructions of the environment does not make much sense. The reason for this confusion is that the word *environment* is most often understood as a surrounding nonhuman nature with which humans interact, but from which they remain entirely separate. How can this natural environment be conceived as somehow socially constructed?

Delving into the study of geography reveals the path to answering this question. For geographers, the term *environment* is not just another term for nature. It also involves what can be called the socially constructed environment that, in turn, includes the built environment—roads, buildings, classrooms, and so on—and the social environment—environments of wealth, poverty, ethnicity, and so on—that are human creations that, just like natural environments, ultimately affect and are affected by human behavior in spatially variable ways. Within the discipline of geography, physical geographers pay most attention to the relationship between humans and natural environments, and human geographers pay most attention to the relationship between humans and their own constructed

environments. Yet ideally, all scientific geographers should be trained in both natural and social science because environmental issues inherently are natural and social phenomena (Archer, 1995).

Precisely how environmental issues are both natural and social constitutes the main topic of this chapter. To take another step down this path, it is necessary to step back and consider again the definition of geography. Environment in this definition includes both natural and socially constructed space. That is, the meaning of this term has been changed so that it does not simply connote nature. For persons who adopt this perspective, the view of what really constitutes the environment in reality is completely changed. When they observe reality, in other words, what is conceived and importantly empirically described as environment or environmental is quite different from the traditional meaning. One can say that the real world has changed for them and is constructed based on their social perspectives. They see it differently from those who conceive the environment as being solely natural, separate from all things human.

Yet following through with the definition as given, this change is not just a conceptual one. The environment also includes actual material and social constructions constructed by humans themselves. The human–environment relationship includes the interactions between humans and their own creations. In short, whereas this conceptual change involves what many are calling the social construction of the meaning of environment, it also entails the actual material–social construction of the environment itself. In the most recent geographic literature, this distinction tends to separate those who discuss what they call the social construction of nature from those who consider what they call the social production of nature (Castree, 2005; Smith, 2008). Although I argue that this separation is not as clear in practice as it appears to be in theory, the difference in emphasis between the two approaches remains significant and extremely important in terms of environmental politics.

The Social Construction of Science

The general idea of social construction emerged in the 1960s as a result of a growing dissatisfaction among scholars in a range of disciplines with how science was then conducted in institutions of higher learning. Briefly, the prevailing understanding of science at the time was that it constituted the objective pursuit of knowledge, via the strict adherence to what is still overwhelmingly taught as the scientific method, and that it was therefore possible to achieve positive, or objective, knowledge of the real world. Not surprisingly, those sciences that could be conducted best according to this model, invariably the physical and natural sciences, came to be regarded as more scientific as the results of their research were considered more objective and factual. In this academic context, it is also not surprising that disciplines in the social sciences and humanities went through a phase in which most practitioners attempted to make use of the scientific method as best as they could to render their work similarly objective and equally scientific. In the history of geography, this trend became misnamed the quantitative revolution in which quantification really was merely the methodological tool used by those hoping to generate a more "scientific" discipline along these positivist lines (Barnes, 2004).

It is important to underscore here that this view of the proper conduct of science served as a powerful impediment to all other ways of knowing the world, rendering these latter mostly silent or illegitimate in both public and scholarly contexts. Within geography, this attitude manifested itself in a growing rejection of traditional, empirical, case-study approaches to geographic knowledge in favor of what was perceived as more scientific studies, supporting intersubjective replication (and quantification). Indeed, whole disciplines (the still so-called soft sciences) were maligned as mostly ideological and nonscientific and therefore much less useful than others (the still so-called hard sciences) in understanding the real world. Keeping this in mind is important to help clarify the reasoning behind some of the more extreme-sounding claims of those in geography now constructing post-positivist scientific understandings of the world.

By the 1960s, however, significant criticisms of the dominant positivist understanding of science began to appear. These criticisms can be best regarded as evolving from sources both internal and external to the practice of science. Internally, many scientists, and particularly historians and philosophers of science, began to question the very possibility of obtaining objectivity in the human perception and interpretation of reality. Practicing scientists knew from experience that much of their work depended as much, if not more, on creative intuition and hunches as on the application of a particular methodology. Observers of science went even further to suggest that science was, in fact, a highly social activity depending not on some objective observation of reality, now considered an impossibility, but rather on a social consensus among scientists as to the very nature of reality.

The best way to understand this emerging, introspective critique of science is by considering how the work of Thomas Kuhn (1962), a historian of science, was construed and spread rapidly in popularity during the time. A great abbreviation of Kuhn's argument is that Kuhn believed, based on his historical research, that scientists already have a worldview with which they observe reality. They can never see the world as it really is or know that they are seeing the world as it really exists because their view of it is already a human interpretation based on the particular worldview within which this view originates. This worldview, or what Kuhn calls a paradigm, is itself constituted by the social nature of science as the individual scientist, after many years of training, is taught to understand the real world as consisting of such and such and not

something else. The individual scientist thus begins to see reality as such and such and does her or his research with this observation as the more or less consciously assumed objective nature of reality. In short, in this view, it is impossible to observe the real world as it may exist external to human interpretation; observation itself already involves such interpretation through the lens of the paradigms we more or less consciously adopt.

Kuhn (1962) certainly would question this brief, much stylized abbreviation of his message (as he came to contest the various uses of his message by post-positivist observers of science), but it gets to the gist of his argument, or at least to the way this argument was later interpreted by the growing number of critics of positivism in the 1960s. Clearly, from the perspective of these critics, if the real world that we observe is, indeed, always an interpretation, then observing this world on the basis of the scientific method gets us no closer to the reality of the real than any other way of observing it. Or put differently, all ways of observing the world are equally right or wrong, and there is no way to adjudicate which is more correct than any other; the usefulness of scientific findings must thus be determined by some means other than truth or objectivity.

Other discussions and scholarly developments in the 1960s simply pushed this critical envelope further. In geography, many began to question the use of the kind of science most practiced at the time in the face of racial and gender discrimination, urban rioting, war protest, and growing ecological degradation. The self-reflections of David Harvey (1973) provide a very good example of the changing interests of many scholars at the time, due to such external, social circumstances. Positivist science increasingly was seen as irrelevant to the issues at hand, especially those in the streets of inner cities. A more relevant science needed to be less abstract, less ivory tower, and more practical, provoking real change in reality. Feminists particularly took a lead in this attempted transformation of scientific practice, first by underscoring the vast underrepresentation of women in science and then by reflecting on the very meaning of this underrepresentation for science in general. One key to this latter concern was of whether or not women brought a different perspective or worldview to the scientific table than men and therefore saw a different reality altogether (Jones, Nast, & Roberts, 1997).

This overly brief account of the challenges to positivism emerging in the 1960s makes it clear that science itself, both in theory and practice, increasingly was considered a social construction, both internally, in the sense of truth as constructed by paradigmatic consensus among scientists, and externally, in the sense that extrascientific social issues thoroughly affect what kind of scientific truth becomes, indeed, paradigmatic. For the present purposes, this account serves as another means by which this notion of social construction can be understood. There can be no completely objective scientific worldview because human beings can never attain what post-positivists have come to call a god's-eye view of reality, somehow clear of human interpretation, as it really exists.

The Nature of Human Nature

Because environment is an already ambivalent, socionatural term, as alluded to above, those who consider the social construction of the environment tend to focus on nature, a term that apparently connotes something real, authentic, and in terms of the environment, singularly identifiable as nonhuman in origin, substance, and process. For most of us, the natural environment simply is out there, in reality, regardless of our human activities related to it or our knowledge thereof. To consider nature as a human construction, and not authentically real, simply jars our imagination and our sense of what constitutes reality in general. And that is the point for those who argue for the social construction of nature. If nature itself is socially constructed, there can be nothing humanly known that is not. This idea, in fact, is already implied by the argument concerning paradigms and interpretation described in the previous section.

A well-known example concerned with human nature, which emerged from the feminist critique of positivism, will help render this discussion a bit more concrete. This example concerns the difference between sex and gender. There still exist conceptions of the nature of women, for example, that suggest that they essentially are, pejoratively, incapable of higher mathematics and scientific thought, garrulous, emotional, cyclical, and so forth, or more positively, they are more intuitive, sensitive, and organized. These supposed attributes of women are deeply ingrained in both the popular and scholarly mindset to the extent that many people still believe that women are naturally this way, given their physical makeup, their sex. Feminists have long argued (and still must), however, that these supposed natural attributes of females are nothing but social constructions that serve to legitimate the socially constructed gender role assigned to females by society—that whatever mathematics or science skills may be lacking are the result of early lack of mentoring or active discrimination within such hard sciences; garrulousness and emotionalism, if true, one of socialization to roles that make such behavior gender-appropriate; intuitiveness as resulting from the forced privatization and silencing of women's voices owing to patriarchy; and so on. The point is that if women exhibit such attributes, it is because they have been gendered—that is, socialized—to behave these ways and not because of their biological nature.

The presumed nature of women is thus considered a social construction through and through. Some feminists and queer theorists now are even questioning whether or not sex, or the biological characteristics and imputed behavioral proclivities of humans, may be socially constructed, or disciplined, to exhibit and perform in certain ways as opposed to others. That is, in what ways is the

performance of the difference between maleness and femaleness, if there is one, a result of the genetic makeup of humans as opposed to a result of social construction? The key to this investigation is understanding that it is impossible to identify this sexual difference because it is impossible to interrogate human nature without human interpretation.

This brief detour concerning the nature of human nature helps set us anew on our path to investigating the socially constructed nature of the natural environment. If it is impossible to observe this nature as it really is, then what it is, in reality, can only be what our various interpretations make it out to be. Those who argue along these lines of the social construction of the natural environment, however, generally fall into two broad categories. There are those who recognize the role of human interpretation, but who nevertheless believe that the reality of nonhuman nature puts limits on the kinds of interpretation that can be provided. Some interpretations, in this respect, are considered more truthful about real nature than others. This view is akin to recognizing that gender is socially constructed, but those of this view still believe that there are real and socially significant differences between biological males and females. Others, however, maintain that nonhuman nature is socially constructed through and through because we can never know a noninterpreted nature as it really is and therefore could never know what sort of limits it might have on our various interpretations. Again, this view is akin to regarding biological sexual and gender difference to be socially constructed.

These two approaches, albeit artificially broad and many times seeping into each other in the work of individual scholars, suggest a difference in emphasis in terms of what exactly is socially constructed. The first suggests that it is our interpretations of nonhuman nature that are constructed, not nature itself. This stance is fully epistemological, that is, a pronouncement on our ability to know a nature that remains somehow external to our knowledge attempt. The second approach, however, is more radical in its understanding of social construction as it adopts a fully ontological perspective, that is, a belief that what really exists as nature is always a combined social and natural phenomenon. Again, as we will see, this difference in the understanding of social construction will show up in geography as that between those who talk of social construction and those who talk of the social production of nature (Demeritt, 2002; Smith, 2008).

The Nature of the Natural Environment

A first cut at specifying how the natural environment is socially constructed concerns interrogating the still overwhelming scientific and popular conception of nature as somehow tending toward balance or some sort of equilibrium state unless disturbed by some external force, whether by human or some other exotic species. Although this view of nature has ancient origins, it has been reinforced greatly over the last several decades by the rise of both ecosystem science and the environmental movement, as will be discussed shortly, as well as by the fact that increasingly, the majority of the world's population consists of people with very little contact with nonhuman nature that is not already heavily molded and otherwise closely managed by humans. I will not interrogate this last assertion in this chapter. However, I do believe it points to the very real possibility that more and more people across the planet consider nonhuman nature as, indeed, stable or harmonious as it is managed around them or, alternatively, want to believe that there is a similarly harmonious wild nature somewhere "out there" that can, and in fact must, somehow be saved from disturbance by humans and other exotic species.

For the present purposes, the key is that this notion of the tendency for nature to achieve a state of balanced equilibrium is really only a human interpretation of non-human natural processes. It is not an objective account of these processes themselves. Indeed, many ecologists have argued alternatively that nature should be conceptualized instead as riven with disequilibria, disturbance, even chaos as a result of evolutionary processes and the ubiquity of change (Botkin, 1990). This interpretation of nonhuman nature is very different, leading many to argue that, at present, ecological science is undergoing, or should undergo, something of a paradigm change in order to understand, and then manage, non-human nature better. This opinion is still held by only a minority, but many hard, scientifically minded ecologists are arguing for such a change in perspective on nonhuman nature, reinforcing the suspicion that both supposedly objective, fact-based views of nature are equally mere interpretations. Ecologists, both for and against the balance-of-nature conception, pursue and publish empirically based research to confirm their positions with regard to nature. Neither group relies simply on theory or rhetoric, but instead they both make full use of the scientific method and empirical research to back their claims.

Again, from a social constructionist point of view, it is impossible to adjudicate between these two claims to knowledge about the natural environment because it is impossible to know this environment as it really might be. Some have argued that, while this may be the case, the two views of nature could be evaluated on the basis of other things, for example, by their respective ability to explain greater bits of reality, by their respective ability to solve the apparent theoretical or empirical puzzles arising within each, or on the basis of a more pragmatic appraisal of what it would mean, in practice, to believe in balance as opposed to imbalance in nature. I cannot treat each of these possibilities in this chapter, but I will make some use of this latter pragmatic form of appraisal when I present the case of the restoration of Florida's Everglades. Briefly, at this point, if one considers the natural environment to tend toward balance, if undisturbed, then one's strategy to protect this environment should be to restrict, if not forbid, all such

disturbance. If instead one considers the natural environment to tend toward change or disturbance naturally, one should evaluate what kinds of changes are more beneficial than others (for whatever announced reason) and promote these by restricting other kinds of change from occurring. The point is that there are very real theoretical and practical consequences that can be derived from adopting one or the other human interpretation of the natural environment. These consequences, in turn, are a means by which different interpretations of nature can be evaluated since the real world of nature can never speak to us for itself.

The Social Construction of Ecosystems

Although the conception of nature as tending toward balance can be shown to have rather ancient roots, it has been significantly reinforced by the emergence and rapid spread of the idea of ecosystems in the immediate post–World War II era. Indeed, the concept of ecosystem represented the earlier rather more aesthetic notion of balance of nature much more objectively scientific in the eyes of many, both inside and outside of academia. The conception of nature as constituted by ecosystems has become, in this way, the dominant understanding of most people today. That this conception may be merely a particular human interpretation of nonhuman nature is seldom entertained by practicing scientists or by the lay public who consider such a conception an already established fact. Most strikingly, in terms introduced above, the ecosystem perspective has become the overwhelming assumed paradigmatic worldview of most people to the extent that it has become virtually impossible to see nature any other way.

This largely unquestioned assumption about ecosystems is precisely what Kuhn (1962) identified as the establishment of paradigmatic normal science. As ecosystem science came to dominance in the post–World War II period, scientists increasingly trained themselves and their students to see nature this way. Once established, this worldview became normalized to the extent that it became unquestioned. Empirical experiments and fieldwork simply take place within this already assumed paradigmatic horizon so that findings that may not support such a view of nonhuman nature come to be viewed as anomalous. In this way, ecosystems have become objective facts of nature, the details of which simply have to be worked out by ever further empirical research.

It will come as no surprise at this point, however, that this understanding of nature has become increasingly criticized by those who believe that the concept of ecosystem is really only a socially constructed interpretation of nonhuman nature (O'Neill, 2001). More specifically, while the ecosystem hypothesis is normally understood to be most dominant in ecology and biogeography because it explains empirical nature better than previous hypotheses, social constructionists argue instead that ecosystem science came to dominance for quite other reasons. In the broadest terms, this account can be characterized as involving social factors that are both internal and external to scientific practice. Internally, focus is put on the rise of cybernetic theory, or early computer science, in the immediate aftermath of World War II. Wartime innovations in cybernetics and general systems theory came to be considered the cutting edge of science to the extent that systems theory began to infiltrate and eventually dominate all sciences, social and natural, in the 1950s and in the early 1960s. The rise of systems theory to dominance was also greatly facilitated by the educational results of the post–War War II GI Bill, which allowed returning veterans much greater access to institutions of higher learning. These returning veterans were both older and more experienced than pre-war first-year university students and much more diverse in class, gender, and ethnic origin. Partly as a result, many veterans taking advantage of this new educational benefit tended to gravitate to the hard sciences and to the engineering disciplines, which had seemingly more prestige in the academy due to the overall dominance of positivism at the time.

Of most significance to the story is that due to this internal prestige factor within the academy, even many of those who entered the social science and humanities disciplines came to adopt a systems approach as a means to render their work more scientific. As both a natural and social science, the practice of geography went through this systems craze as a significant part of what has become known as its more general quantitative revolution. Not surprisingly, then, new students and eventual professors of ecology and biogeography came to view nature as comprised of systems of necessarily interrelated species and their physical surroundings involving relatively closed flows of matter, energy, nutrients, and so on with complex feedback loops rendering the ecosystemic whole greater than the sum of its parts (Odum & Odum, 1954). In short, this account of the rise to dominance of ecosystem science puts much more emphasis on emerging trends within the social practice of science than on its overall success in relation to other ecological hypotheses and in actually explaining natural processes.

Yet there is more to this story that serves to reinforce this account of the social construction of ecosystem science. This addition concerns social relations quite external to scientific practice. The rise of broader-based social concern for the environment in the 1960s, for example, provided much popular support for the new ecosystem approach because it enlisted a very convenient, and ultimately quite successful, scientific legitimating argument for protecting as much nature as possible from the perceived intrusions, and degradations, of humans. That is, if nature is systematically related in the form of ecosystems, then intruding on one part of these systems will necessarily affect all other parts. Thus, if the spotted owl is a necessary part of the wider ecosystem of old growth forests in the Pacific Northwest of the United States, then intruding by cutting trees in the forest in certain places will affect not only these places themselves but also the spotted owl. If

our goal is to protect this species, then absolutely no cutting of the forest should be allowed. Or if Florida's Everglades is one large ecosystem covering most of south Florida, the only way to preserve it or fully restore it is to cordon off this vast territory by more effectively managing human intrusion or even forbidding it altogether. Or if the whole planet is one large ecosystem in the form of what has been called in scientifically laden terminology the Gaia Hypothesis, then we always should be careful how we touch one part of this global system for fear of how it might affect all other parts.

Ecosystem science thus became a quite successful tool for a certain kind of environmental politics that emerged at a particular time and remains prevalent in most advanced postindustrial societies today. Indeed, recognizing that this notion of internal and external social relations is artificial at best simply brings the overall point home. Ecosystem science emerged and came to dominate ecology and biogeography only in the post–World War II era. Those scientists who built this theoretical dominance were mostly new to the field in career and often young. That many of these new scientists also took part in, or were sympathetic to, the new environmental politics cannot seriously be denied. In the end, the internal and external social relations that gave rise to, and fully established, the dominance of the ecosystem hypothesis merged with each other in mutual reinforcement. And this mutual reinforcement has resulted in the very difficulty of conceiving nature any other way on the part of both practicing scientists and, particularly, the lay public. Today, the real existence of natural ecosystems simply is the uninterrogated, fully assumed nature of real nature for most people.

The Social Construction of the Environment and Geography

This account, then, is a social constructionist view of the rise and dominance of ecosystem science in ecology and biogeography within the broader field of geography. Clearly, the accounts and rationales presented thus far in the chapter go against everything that most scientists and laypeople think about science in general. It is no wonder that many ecosystem scientists fully resist this view of their practice and its results (Soule & Lease, 1995). Nevertheless, as mentioned, there are a small but growing number of scientists who question this conceptual construction of nonhuman nature. On the basis of their equally scientific perspective, these scientists suggest that nature is not a system of systems as much as it is a veritable mosaic of different species processes and relationships. Not only is it virtually impossible to determine objectively where one ecosystem ends and another begins—that is, the scale question—but the very notion of system needs to be jettisoned. Again, nature should not be regarded as tending toward systematic equilibrium, but rather continually tending toward disequilibrium, even chaos, as a result of differing evolutionary species processes with unequal rates of change and diverse patterning across the natural landscape. This view of nature emphasizes the patchiness of species relationships with very few necessary or systematic linkages and these only temporary within variable evolutionary timeframes (Wu & Loucks, 1995).

This alternative, what some have called postmodern, conception of the natural environment has not been considered much yet within mainstream geography, but it has emerged from the discipline indirectly in at least two ways. First, there has been some discussion about the nature and ultimate meaning of invasive or exotic species, a conception prevalent in the discussions of ecosystems. Invasive species, such as kudzu vine in Georgia and Brazilian pepper trees in the Everglades, are considered those not normally included in a particular ecosystem. They are observed to create some harm by not adapting as a system species fast enough and propagating themselves faster and to the detriment of original system species, or in general, they break up the natural systematic relationships already established and thereby lead to overall disequilibrium and ultimate systemic degradation. Billions of dollars are spent each year across the planet in the effort to eradicate such invaders in the name of protecting the environment.

More scientists, however, argue now that this very idea of invasive species is a social construction that is very much based on the equally constructed notion of relatively closed and unchanging ecosystems in some sort of equilibrium state. In this view, not only is there a problem with the assumption of such equilibrium, but it is also considered conceptually difficult to determine at what point a species should be considered originally a part of an ecosystem. All species after all were invaders of particular landscapes at some point in their existence. It also does not help that some species eventually come to be considered naturalized species in the more sympathetic research literature. The point is that, much like the quite similar term *weed*, the notion of invasive species is merely a human interpretation of a contemporary and localized state of the natural environment and not necessarily the reality of ever evolving nature itself (Warren, 2007).

Yet if all conceptions of the natural environment similarly are nothing but social constructions, how are we to know which social construction explains the reality of the natural environment the best? Is it any wonder that most scientists and laypeople fully resist such arguments concerning social construction? Such arguments apparently remove scientific objectivity and certainty from them and the research they pursue. Indeed, this is why, while many are sympathetic to the idea of the social construction of the environment, most still believe that there is a way to objectively test constructions against each other in the normal scientific manner. But this position is clearly impossible if all that we can know of an external world is already socially constructed.

Again, recognizing this, I will use other, more pragmatic means to evaluate these social constructions of the

environment. That is, what are the practical implications of believing in the reality of one such construction over the other? Briefly, the practical implications of believing in ecosystems are as follows: first, that order is assumed in nature rendering knowledge of nature possible and more certain and second, if ecosystems really exist in nature, than we humans really cannot touch one part of these systems without affecting all other parts. Both implications appear favorable to our ability both to objectively know the real world as well as to protect the environment, as described earlier in the chapter. The alternative, nonecosystem interpretation of the natural environment appears less favorable in this regard. A chaotic nature is very difficult to get to know with any degree of certainty, and if nature is really just an ever changing mosaic of species in evolutionary juxtaposition, then it is possible to touch nature in one part without affecting other parts.

This latter conception clearly makes it difficult to argue for the protection of the natural environment on anything other than the most local scale, and there are doubts as to whether that is even possible. But this is only a first attempt at theory evaluation. What constitutes science in the 21st century is just such reasoned disagreement. It may be, for example, that when dealing with the natural environment scientists might have to deal with uncertainty. In this respect, an artificial certainty constructed around a conception of relatively closed systems may be less useful to our scientific objectives than one constructed around a conception of more chaotic natural processes. Similarly, while it may seem, on first consideration, that the conception of ecosystems provides a better means to protect nature, it may come at too high a scientific and social price. As I will illustrate in the case of Florida's Everglades, the very empirical complexity of this vast ecosystem has rendered a scientific understanding of the functioning of the whole quite impossible even after myriad research studies. It has also rendered quite uncertain how best to restore this natural wonder to its original, supposedly more natural state.

The Social Production of Nature

Another indirect way that the growing criticism of ecosystem science has emerged in geography is within the discussion of the actual production of nature. The idea of the production of nature considers the ways in which humans not only interpret but also materially construct their environments, both social and natural, which can be called socionatures. The lethal weakness of normal ecosystem science from this perspective is that it does not consider humans a part of nature, but rather somehow external to nature and affecting it for good or, more usually, for bad. In contrast, the production of nature argument assumes from the beginning that humans and their material and social constructions are not separate, somehow external phenomena, which then affect nature. Rather, the assumption is that the human–natural divide is a false one and that all nature includes humans not just in the epistemological sense of interpretation, but also in the ontological sense of actual material and social production. Humans are always already a part of nature in the sense that, for example, the Everglades is considered really to have included human productions over a very long past.

The idea of the production of nature is meant to jar our sensibilities even more concerning both science and the natural environment. Geographers who originated the concept of social production intended it as a critique of both the ideas that science of nature eventually will provide the objective foundations for environmental politics and that human activity is an external, disturbing force in nature that needs to be attenuated, if not completely eradicated (Smith, 2008; Swyngedouw, 2007). Each of these theoretical positions is ultimately political in intent. If science is socially constructed, then it does matter what constructions prevail over others. The still dominant scientific view of an external nonhuman nature that can be known objectively ignores the politics and the political implications of how some interpretations come to be considered more objective than others. Similarly, this specific scientific construction of an external nonhuman nature renders it that much more difficult to understand environmental problems (and possible solutions) as essentially combined socionatural phenomena. Humans can never be entirely banished from nonhuman nature, as some scientists would like to suggest, because they are already a part of nature.

In short, as one prominent geographer who has considered the production of nature perspective states, the "key political question is one that centers on the question of what kinds of natures we wish to inhabit, what kinds of natures we wish to preserve, to make, or, if need be, to wipe off the surface of the planet (e.g., the HIV virus), and how to get there" (Swyngedouw, 2007, p. 23). The kind of socionature we produce and how is up to us to decide. There is no objective, external nature that can decide for us what kind of socionature is best, more sustainable, more just, or so on.

The Nature of Florida's Everglades

A case study may help render this rather abstract social construction discussion more concrete. Since 2000, there has been a comprehensive effort to restore south Florida's Everglades (U.S. Government Printing Office, 2000). The Everglades Restoration Plan is often described as the largest attempted ecological restoration in the world. It is now projected to cost some $10.4 billion in federal and state tax revenue over the next 30 years with increasing costs—some say exponentially so—likely in the near future due to unproven technologies still to be tested, potential adaptive management changes, and inflation. Action on the plan has been very slow, however, with many major projects and even research studies still not begun a decade after its official enactment.

The Everglades Restoration Plan garnered bipartisan political and overwhelming popular support as it was intended to restore the entire ecosystem of this national treasure, or so it was proposed. Of importance, the underlying assumption was that this plan would be an entirely science-based ecological restoration effort rendering it above and beyond political interests. Even the big sugar corporations, historically much involved in changing south Florida's natural landscape, signed on to ecological restoration, demanding the best objective science possible. Science, it was understood, eventually would come to a fuller, more objective understanding of the Everglades' natural system, and project management would adapt itself to the latest scientific research findings.

Problems soon emerged, however, when it became clear that the south Florida's natural ecosystem designated as the Everglades really is a mosaic of socionatural environments involving not just the publicly managed national park (which represents only about 50% of the original Everglades) but also vast agricultural–industrial complexes and considerable areas of urban sprawl. Since the Everglades National Park already existed, ecological restoration of the Everglades, in other words, needed to incorporate the entire ecosystemic watershed of south Florida, extending from north of Orlando to the southern tip of the peninsula. But if this is the case, then it was necessary to consider an ecosystem that covers some 7,000 km^2 (18,000 square miles) of socionaturally diverse territory. Indeed, this conceptualization of comprehensive ecological restoration was one of major reasons for the delay in project enactment. To even conceive of all the systemic processes over such a large territory was well-nigh impossible with or without more elaborate models and all the computer processing power that could be brought to bear.

In this context, ever more scientific research appears to be leading to more rather than less certainty about south Florida's ecosystem and how best to restore it. The continually announced goal of "getting the water right" seemed to save some identified-important species at one end of the system at the expense of other identified-important species at the other end. Such ecological complexity also makes it nearly impossible to determine how to sequence major engineered waterworks projects to best emulate traditional natural processes. It is no wonder that there has been extended discussion in the scientific literature about the growing problem of coordinating all the scientific research being undertaken in the name of the restoration of the Everglades in order to get a better picture of the whole system (Clark & Dalrymple, 2003; Zweig & Kitchens, 2010).

Interpreting south Florida's natural environment in ecosystemic terms thus seems to be more of a problem than a solution to regional environmental issues. Perhaps, then, a better interpretive construction of this environment would lead to better practical results. Arguably, if a more critical, even nonecosystem framework were to be considered much could be done right away and in a less costly manner to ameliorate the environment of south Florida by more effective land-use planning, by elevating the Tamaimi Trail highway that bifurcates the region cutting off water flow, by reducing agricultural production on Everglades territory, by simply taking out the vast system of dikes and canals put in place decades ago to control flooding in the area, or so on. The point is that such localized projects, based on local decisions deriving from better understood local environmental conditions, can be undertaken more rapidly and for much less cost. Surely this is better than waiting to take action for some comprehensive understanding of a vast ecosystem that may never materialize and that, in fact, may not even exist except in the minds of ecosystem scientists.

More radically, the environment of the Everglades can be considered a prime example of the production of nature. The Everglades Restoration Act passed with full bipartisan support and agreement with major sugar companies and environmental groups, such as the Audubon Society. Passage was fully based on the notion that it would be science driven on the basis of objective knowledge of the real Everglades ecosystem and its needs (Grunwald, 2006). Yet such knowledge is not attainable—not just because of the territorial extent of south Florida, but also because of the socionatural construction of this environment as we have discussed more generally throughout this chapter. Conceiving science and its results as somehow an objective foundation for restorative action simply evacuates the politics from what is ultimately a political decision as to what kind of socionatural environment we want. Specifically, what we should do about the Everglades remains a political question concerning what sort of south Florida socionature we want to produce. Such a political question simply cannot avoid difficult choices to be made and ultimately nonconsensual deliberation. And specific choices made will necessarily have quite differing socionatural consequences in the form of more or less urban sprawl, more or fewer golf courses, more or fewer human inhabitants, more or fewer lawn watering days, more or less sugar production, or so on. In the end, determining how we produce the socionatural environment in south Florida will involve some difficult political choices that cannot be avoided on the basis either of an assumed scientific objectivity or on a somehow self-reporting reality of nonhuman, Everglades' nature.

The Social Construction of the Environment in the 21st Century

Because geographers are trained in both the natural and social sciences, they should be central to discussions concerning the construction and restructuring of socionatural environments like that now being undertaken in south Florida. Since just recently and for the first time in human history, the majority of the world's human population now resides in cities, such discussions have become ever more crucial across the planet, from the instant city-states dotting

the Persian Gulf to the planned eco-cities of China on to the ever sprawling slums of megacities of the Global South. How decisions are made concerning the construction of such socionatures will determine the very extent and specific characteristics of the world's environmental problems in the 21st century. Again, such environmental problems inherently are a complex intermeshing of social and natural phenomena. Geographers, then, should be at the forefront in terms of determining both their possible causes and then possible solutions to such problems.

The specific perspective of social construction makes this focus on socionatures even more clear. Understanding what is usually considered as simply the natural environment as always already constructed by human perception and, indeed, by the productions of humans themselves renders it that much easier to view environmental issues as just such complex socionatural phenomena. In the end, to the extent that geographers and ecologists actually engage with the idea of social construction will determine their effectiveness in terms of meeting the real environmental challenges of the 21st century. To the extent that they do not, such socionatural challenges will be rendered both that much more incomprehensible and that much more difficult to solve. Geographers, given the very nature of their discipline, should be the first to recognize this.

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