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Representations of Nature on the Mongolian Steppe: An Investigation of Scientific Knowledge Construction

Extensive land degradation across the Mongolian steppe has prompted a variety of multinational and multidisciplinary research projects over recent years. The situation provides an important opportunity to investigate and illuminate some of the international, national, and local dimensions of scientific practice that critically condition the production of environmental knowledge. In this article I juxtapose the competing knowledge bases and assumptions of various relevant groups (including natural vs. social scientists, nationalist Chinese vs. ethnic Mongolians, and urban intellectuals vs. indigenous herders) to develop the argument that multiple ideological and institutional boundaries work together to circumscribe scientific inquiry and data collection. The situated construction of knowledge undermines prospects for improving incremental objectivity and impedes more comprehensive understanding of serious environmental problems. [*Chinese grasslands, land degradation, indigenous knowledge, sociology of science, interdisciplinary research*]

The intent of this article is to reflect analytically upon my recent experiences operating within one of many multinational and multidisciplinary scientific research efforts dedicated to increasing human understanding of a common global problem (land degradation) in a common geographical setting (the Mongolian steppe). My own perspective derives from my role, on the one hand, as a general participant in formal and informal international forums and, on the other hand, as an isolated Western anthropologist living and working among Han Chinese natural scientists in a grassland ecosystem research station, which was itself embedded within a remote community of ethnic Mongolian herders. I hope to use these multiple frames of reference to investigate and illuminate some of the international, national, and local scales of scientific practice that critically condition the production of scientific knowledge and land management policies in China (and presumably elsewhere). I argue that the three scales work together to amplify the influence of local circumstances in shaping scientific inquiry and data collection, yet simultaneously work to conceal active manipulations and even to privilege non-local representations of nature through the exercise of social power.

Such an assertion has several significant implications. First, it reinforces the well-established notion that science operates as a collective human enterprise that is subject to a variety of potential distortions, such as paradigmatic blinders (Kuhn 1962; Merton 1957), institutional parameters (Douglas 1986; Latour and Woolgar 1986), and social negotiations and cultural conventions (Bird 1987; Harding

1991).¹ Second, it indicates that, despite the frequently assumed internationalism of modern science, the study of the natural world actually remains highly site-dependent and regional in character (see also Livingstone 1995; Nicolson 1989). Third, it warns that some scientific representations may be significantly more culture-bound than others and that unexamined conceptual boundaries may structure the routine work of scientists, even though all biases are not necessarily deliberate or even conscious. Fourth (and most significant), it highlights the need to expose the vernacular dimensions of scientific knowledge production that enable some groups to exploit others by perpetuating their subjective (mis)representations of nature. That is the specific task I set for myself here.

In this article I build upon a line of critical analysis popularized by Foucault (1972, 1980) and pursued by many others (see Crush 1995; Escobar 1995; Marglin 1990; Mitchell 1988) that identifies power as central to an understanding of science and knowledge. These studies characterize economic development interventions undertaken in the name of modernization as a homogenizing process that imposes a rigid physical and conceptual order on subject populations, which makes it extremely difficult for anyone even to imagine alternative scenarios. For example, Escobar (1995) has recently labored to reveal international development efforts as a flawed "regime of representation" that imposes violent power-driven interests on non-Western targets (especially peasants, women, and the natural world) under the guise of scientific neutrality. In that same context, I am interested in applying a discursive

analytic frame to the more narrow subfield of environmental management, which is a central concern of both development studies and science studies. Like Escobar (in contrast to Foucault), I believe that a critique of representational regimes opens up an intellectual space to achieve a new (and ultimately constructive) perspective on routinized social practice. I also believe that such efforts are best served by relating abstract discussion to the everyday behaviors of people in specific locations.

Without subscribing to an epistemological program of either radical relativism or strict realism, I contend that scientific knowledge of Chinese grasslands derives to a significant degree from the dynamics of situated social relations (and not just from rigorous observation of biotic and geophysical phenomenon interpreted objectively through rational thought). In Inner Mongolia, as elsewhere, representations of nature do have their sociocultural fingerprints, though they remain conspicuously unacknowledged and unexamined in the scientific literature published to date. It is necessary that someone investigate the production of knowledge on the Mongolian steppe and explore the use of grassland sciences as a tool of social control.

Before presenting the case study, however, I find myself obliged to clarify my own epistemological position along that relativist-realist grid that underlies all contemporary debate over scientific authority. As an anthropologist, I am not concerned here with questions of ultimate Truth or Reality in any metaphysical sense of the word, but only with the social representations of phenomenal realities that can be registered through the sensory apparatus of our biological bodies. We must assume, for example, that there is a reliable connection between mind and matter and that empirical observation counts for something. Speaking then within that phenomenal universe of experience, it is my position that scientific representations are always culturally embedded and socially constructed in non-trivial ways, although some representations will conform closer to the theoretical ideal of an unmediated objective reality than others. It is also my position that conceding the inevitable social construction of scientific representation need not necessarily eliminate the theoretical possibility for scientists (whether natural or social) to seek and secure a perspective of observation that is sufficiently objective and politically neutral to move human understanding of the phenomenal world forward.

I hold both positions concurrently and find myself in good company with many other ethnographers who are actively resisting the essentialism otherwise implied by either pole of the relativist-realist spectrum (see Berglund 1998; Descola 1996; Escobar 1999; Haraway 1988; Hayles 1995; Latour 1993). For example, Hayles endorses this nuanced position as a "constrained interpretation of constructionism," Haraway embraces it as "partial perspective" within a "successor science," Latour sardonically accepts it as "the place for wishy-washy interpretations," and Escobar

affirms it as a balanced "antiessentialist theory of nature that acknowledges equally the cultural and the biological." The strategy is to recognize and trace the parameters of subjectivity as the very means by which to pursue consistency in our scientific accounts of reality. I join these and other scholars in trying to work beyond the sterile relativist-realist divide, even as we must use the concepts and language of that dichotomy to make our thoughts understandable to others.

Anthropologists can concede the absence of a perfectly unbiased "Archimedean perspective" on knowledge creation even while asserting that the validity of their own representations can be improved through skillful translation, extended periods of fieldwork, refined methods of data acquisition, and artful participant-observation. We are concerned not with ultimate metaphysical truths, but with incremental objectivity in a transient and ephemeral world. Thus, the essential point of this case study is not that scientific work should be abandoned (as if less rigorous and less rational methods might improve our knowledge base), but that scientific enterprise can tend to ignore and/or distort details that are incompatible with dominant sociocultural assumptions and routines, and that we should strive to eliminate such biases wherever possible. Ethnographic studies of knowledge production that help elucidate the perspectives of those at the recipient end of scientific practice provide important opportunities to work through many of these abstract but highly significant issues.

Background

It is widely understood that land degradation has become an acute social problem on the arid steppelands of Inner Asia (for critical analysis of the conventional view, see Williams 1997a, 1997b). Chinese scientists and officials monitor the situation closely, revising survey data every year. In recent public statements, prominent officials classify 27.3% of the national landmass (2.62 million sq km) as desert area (Jiang 1997). This compares with 15.9% reported in 1993 (Xu 1993). Officials now estimate that grassland is lost to moving sand at a rate of 2,460 sq km per year (Xu 1997), compared with the rate of 2,100 through the 1980s (China State Council 1994:181). The menacing sand belt stretches some 5,000 km from west to east across China's arid northern rangelands, purportedly affecting the livelihood of nearly 400 million people (Wang et al. 1993:1). The situation is particularly severe in the autonomous region of Inner Mongolia, where officials report a loss of 3,400 sq km per year and estimate that only 32% of total grassland area still exists in undeteriorated conditions (Zhou 1993).

These environmental concerns have provided the context in which a variety of multinational and multidisciplinary research efforts have been organized to occur in both the Republic of Mongolia and the Chinese autonomous

region of Inner Mongolia over the last five to ten years. Asian scientists and officials, anxious to raise agricultural productivity in the grasslands (and to tap into international funding opportunities), have opened up to Western natural and social scientists in a number of large and small collaborative projects.

The most ambitious has been the University of Cambridge MacArthur Environmental and Cultural Conservation in Inner Asia (ECCIA) project, which involves both social and environmental research in the comparative study of the Inner Asian steppe and its peoples across Mongolia, Inner Mongolia, Buryatia, Tuva, and Xinjiang. Much of this research has been published under the names of Caroline Humphrey and David Sneath (1996a, 1996b, 1999), including two edited volumes of essays authored by Chinese, Mongolian, Russian, and Western scholars. Another initiative in Mongolia is the Policy Alternatives for Livestock Development Project (PALD), based at the Institute of Development Studies in Sussex, UK. Much of this research has been published under the names of Jeremy Swift and/or Robin Mearns (Mearns 1993; Swift and Mearns 1993). The Nordic Institute of Asian Studies in Copenhagen organized a Central Asia workshop in 1993 that examined continuity and change in Mongolia and produced a collection of research papers edited by Ole Bruun and Ole Odgaard (1996). Another project, focusing on Inner Mongolia, Xinjiang, and Gansu province in China, brought together Australian and Chinese agricultural economists to study pastoral wool production and marketing. This work was funded by the Australian Center for International Agricultural Research (ACIAR) and has produced publications under the names of John Longworth and Greg Williamson (Longworth 1990; Longworth and Williamson 1993).

In the United States, a loose organization of scholars identified by the acronym GEMS (Grassland Ecosystem of the Mongolian Steppe) was nurtured by the Committee on Scholarly Communication with China under the leadership of James Reardon-Anderson. Following upon the publication of a volume that surveyed the general state of grasslands and grassland sciences in China (National Research Council [NRC] 1992), the GEMS project organized two working conferences and attempted to facilitate interdisciplinary research networks among Mongolian, Chinese, European, and American scholars. A central goal was to publish an edited volume of articles that reached across national, disciplinary, and methodological boundaries of environmental knowledge. The forum was inclusive, so that scholars involved with both ECCIA and PALD also participated in GEMS.

There have been numerous lower profile collaborative research efforts stimulated and/or initiated by all this intellectual enthusiasm for Inner Asian grasslands. For example, it was through participation in the GEMS project that I

found a Chinese institution in Inner Mongolia willing to host my own dissertation fieldwork. I worked twelve months in 1993–94 collecting data in Chifeng City Prefecture of Eastern Inner Mongolia under the sponsorship of the Shenyang Institute of Applied Ecology within the Chinese Academy of Sciences, which operates a small weather station and grassland research outpost in Nasihan Township.

The climate of Nasihan Township is semi-arid, with mean annual precipitation usually ranging between 300 and 500 mm. The total rangeland area is roughly 613 sq km, but officials consider 97% of it to be "deteriorated." Though sand or moving dunes occupy 90% of the land, township officials estimate that 51% remains at least marginally useful for livestock production (Nasihan Sumu Official Document 1991:1). In 1993, the township had a total population of nearly 4,000, with 95% comprised of ethnic Mongols. Wulanaodu, the largest of ten township villages and the place where the research station is physically located, had a population of 740 people divided among 174 households. The population was 98% Mongol ethnicity, and stock herding of cows, sheep, goats, camels, and horses still accounted for 87% of community income (Wulanaodu Gacca Official Document 1993). The cash economy remains small, with a per capita net income of only 400 yuan per year (approximately US \$50). The area thus ranks among the poorest in all of China. I communicated with everyone in Mandarin Chinese, although most of the residents could speak both Mongolian and Mandarin.

The research scientists from Shenyang have controlled a sizeable portion of enclosed land (about 3,000 hectares) throughout the township since 1970 in order to conduct experiments in desert fixation and afforestation. Over the last 25 years, a dozen or so Han scientists² have rotated in and out, usually in small groups for a month at a time from March through October. Their self-described mission is to study and disseminate information about comprehensive grassland management strategies, to improve and intensify the rational use of local resources, and to raise animal husbandry production capacity. A billboard in the research station conference room declares the general scientific mission: "to change the natural appearance of the area." Unfortunately, the objectives and language of contemporary scientists cannot be isolated from the activities and rhetoric of Han colonial incursions into Inner Mongolia over the last century (see Williams 1996a).³

The research station originally acquired its land base through negotiations with local commune and brigade leaders. It was reported to me that brigade work units assisted the scientists in bulldozing land and constructing the various living and research facilities, including dormitories, a kitchen, a garage, offices, a conference room, a laboratory for soil-plant analysis, a weather station to record atmospheric data, a shelter-belt and nursery to surround the

compound, outlying artificial meadow and forest areas for controlled experimentation, and additional scattered plots for the study of dune fixation, alkalization, irrigation, vineyard and orchard production, and even wet-rice cultivation. Throughout the region, the scientists have enclosed (but do not monitor on a daily basis) an estimated 40,000 hectares of experimental plots (Zhao 1992:2). Supported by a series of five-year research grants (reported to be about \$65,000 in the last round), the scientists understand their first priority to be data collection and experimentation, and their second priority to be the demonstration of scientific techniques to local farmers and herders.

Typical soil and dune fixation experiments involve planting a variety of drought-resistant tree, shrub, and grass species on different types of enclosed soils and dunes to record the biological and geophysical results over time (growth of biomass, root length, composition of vegetation, changes in soil PH, soil carbon levels, distance of dune advance, etc.). Experiments in meadow salinization involve variations in the application of gypsum, in the selection and methods of planting salt-resistant grasses, and in the diversion of flood water (again, on enclosed sites presumed to lie fallow from the grazing and production pressures of local residents). The experimental plots are intended to demonstrate to the community both the technical procedures and the economic rationale for replacing traditional and extensive management strategies with a more labor and capital-intensive husbandry. Over the years, the scientists have recruited a small network of "model" households who are willing to receive their instruction and assistance in planting trees, treating soil, cultivating fodder crops, or developing orchards.

Scientists at the Shenyang Institute invited me (as a participant in GEMS) to live for one year at the research station in order to investigate the human and historical dimensions of grassland degradation in the area. The context of resource management thus allowed me to gain long-term access to an otherwise restricted and relatively uninvestigated area of China. The unusual juxtaposition between Han scientist and Mongol herder afforded me a convenient opportunity to explore differential group perceptions and attitudes toward local landscape ecology as well as toward economic development interventions and the ongoing work of the scientists.⁴

For twelve months I engaged in ethnographic fieldwork throughout the township, conducting daily participant-observation and a variety of formal and informal interviews within both the herding and scientific communities. With local residents, I became physically involved in practically every aspect of animal husbandry production: herding, haymaking, fencing, feeding, milking, shearing, slaughtering, breeding, vaccinating, and marketing. I also undertook hundreds of household surveys in domestic settings that focused primarily upon questions related to land use, grazing strategies, and perceptions of local landscape and public

policy reforms (see Williams 1996b, 1997b, 1997c). With the scientists, I worked (occasionally) to collect soil and vegetation data, plant trees and shrubs, monitor dune fixation, transport equipment, and maintain the grounds.

I would characterize my relationship with the scientists and staff at the research station as cooperative and friendly (even jovial most of the time). My daily interactions with them blurred the lines of work/play and visitor/host so that I quickly graduated from status of "guest" to that of "colleague" and even "confidant" at times. Our living circumstances were simply too intimate and too spartan and my duration of stay just too long to maintain the conventions of polite separation that normally characterize Chinese relations with foreign delegations. (Indeed, since the scientists rotated in and out of the station while I remained behind to send them away and welcome them back, we frequently joked that I had become the true "host" of the compound). Of course, we also shared many significant interests and experiences that bound us together both professionally and emotionally.⁵

Over time, I also developed a positive working relationship with the local residents. The scientists never asked the residents for permission to invite me (nor anyone else) into their community. I was introduced to local administrators long after the fact of my arrival, and I only gradually found ingress into village life through my own efforts. At first, residents were understandably quite hostile to my presence. Many of them assumed that I was a government spy, although nobody could imagine what I might really be investigating. Thus, the relevance of social power to my very presence in the village was explicitly recognized by all. Given this circumstance, I felt great achievement in the success of gaining broad acceptance and even emotional attachment among so many households by the time of my departure.

Analysis

I begin this case study with the subjective observation that despite high expectations by many scholars and funding agencies for comprehensive and influential research projects on the Mongolian steppe, the overall results so far have been disappointing. Although most of the research has been fairly international in character, it has not been especially interdisciplinary. Instead of reaching for creative connections across disciplines in a broad synthetic framework, research efforts have basically splintered into individual projects with predictable and rather limited agendas. Nor has new research provoked any major policy initiatives in Mongolia or China. On the contrary, the two governments continue to endorse rather contradictory systems of rangeland management—the Chinese have opted for privatization and parcelization while the Mongolians have favored extensive and communal grazing. Nor have a trickle of publications dramatically lifted a marginalized

land and people from the margins of scholarship and scientific concern. In short, despite the widely shared interests in geographical setting and research agenda, international hopes for meaningful collaboration and innovative knowledge production across traditional boundaries have not been fulfilled and national rangeland policies remain unchanged.⁶

It seems to me this situation follows from a series of ideological oppositions that structure divergent social interests at the international, national, and local scales of reference.⁷ I will briefly discuss each in turn, beginning with the international scale and a specific intellectual tension that created problems for participants of the GEMS project.⁸

International Scientific Scale

A fundamental obstacle to interdisciplinary collaboration is the absence of a common framework to talk about human-environment relations in nonconfrontational terms. This seems especially relevant in international academic forums where inevitable concerns about hospitality and national pride play a role in structuring polite discussion. An essential problem is that the language of scientific analysis still requires privileging either nature or culture as a dominant force of environmental transformation. Even research that shares a common focus upon landscape ecology cannot get beyond the familiar dichotomy. Although landscape ecology readily adopts the human scale as a frame of investigation and explicitly recognizes human action as a modifier of the spatial and temporal distribution of nonhuman species, it has problems integrating human production systems with biotic and geophysical processes into a comprehensive conceptual analysis, and so perpetuates the rigid distinction between nature and society (Bohm and Peat 1987; Crumley 1994:3; Naveh and Lieberman 1990).

This intellectual division of labor has been evident in Western studies of pastoral production systems (see Hjort 1982). But it has been especially rigid in the practice of Chinese grassland ecology, where social factors in ecosystem dynamics have been almost totally ignored (Loucks and Wu 1992:80). Chinese scientific literature and data collection overwhelmingly focus on biotic interactions among soils, plants, and herbivores, with little attention to the actual behaviors and motives of human grassland inhabitants. When Chinese data do focus on grassland residents, the information is typically limited to narrow economic parameters, reporting such figures as animal units, stocking ratios, and production/consumption levels. A prominent social scientist from Beijing University recently conceded that Chinese grassland studies have generally ignored such basic social concerns as household production strategies, risk management, allocation of labor, and the role of competitive markets and prices. But this is not terribly surprising since the formal study of sociology was discontinued within Chinese research academies and

universities from 1952 until 1979, and only one university since 1980 (Beijing University) has organized a program of sociological research in the grasslands (Ma 1992: 122–123). In short, it has been common in the West and in China that natural landscapes are treated as the exclusive domain of natural scientific inquiry while cultural landscapes (i.e., the political economy) are consigned to the domain of social scientific inquiry.

Such intellectual territoriality can sometimes give rise to rather hostile and imperialist sentiments. For example, in a prestigious scientific journal one Western scholar suggested that only biologists have the expertise and awareness to decide the proper use of the world's tropical landscapes:

Engineers build bridges, writers weave words, and biologists are the representatives of the natural world. If biologists want a tropics in which to biologize, they are going to have to buy it with care, energy, effort, strategy, tactics, time, and cash. And I cannot overemphasize the urgency as well as the responsibility. . . . In short, biologists are in charge of the future of tropical ecology. [Janzen 1986:305–306; also cited in Guha 1989]

Beneath this call for wildlife preservation lies a clear concern to defend disciplinary authority and to perpetuate the established boundaries that separate natural and cultural processes. By contrast, contemporary social science literature basically defines *landscape* as a heterogenous composition of human-made space (Jackson 1984:8). This means that landscapes are not construed as natural features of the environment at all, but as synthetic social constructions, which function and evolve not in strict accordance with natural laws so much as to serve a community of symbol-creating members. Landscape-focused research has thus provided a fresh intellectual arena in which scholars engage in potentially explosive ideological combat: what disciplinary perspective and method is best qualified to interpret and represent localized land forms? Although natural scientists have historically been authorized to represent and speak for nature, their authority no longer goes unchallenged, either within the academy or increasingly even among the lay public.

The theoretical distinctions that social scientists increasingly make between Nature and nature-as-an-object-of-knowledge seriously problematize prospects for interdisciplinary cooperation. Once the natural order is imagined to be a social construction, then physical scientists would seem to have no privileged role in discovering truth about objective reality. In such a quandary, finding a unified framework to guide research and working out a coherent means to incorporate the knowledge generated from other disciplines is no straightforward task. But research scholars do not necessarily address in such explicit terms the reasons for abandoning integrative efforts at knowledge production.

For example, the closing discussion of the 1993 GEMS conference generated a variety of diagrams that individuals

proposed to model the way an integrated and comprehensive project might ultimately work. Different proposals privileged different knowledge bases with the position of strategic centrality, but at the close of the day, discussion ended without resolution or even a frank exchange over issues of disciplinary authority. Instead, these animosities were vented and contained within the context of muffled voices in hotel corridors. (I overheard some of them—statements like, “Most of these people don’t appreciate complex research” and “I doubt more than a handful in that room could understand your presentation” and “I tuned out when they were speaking.”) Predictably, the same unresolved problem surfaced again in 1996, when an edited volume of essays failed to gain final acceptance for publication. At the last minute, a managerial decision was made that the volume lacked a coherent theoretical framework (for the analysis of environmental transformation) that could make all the different pieces fit together (Reardon-Anderson, personal communication, 1996). Though the articles were individually worthy of publication, editors believed they could not be reconciled within a single volume without exposing a range of contradictory perspectives that suggested intellectual chaos.

There are many reasons why books do not get published. My point is simply that conferences, publication projects, and peer review are common forums where disciplinary tensions over issues of scientific authority are often vented but left essentially unexamined and unresolved. At the GEMS conference, turf battles (which were implied but unengaged early on) helped to channel participants into rather conservative research alliance strategies. For the most part, Western scholars collaborated with Chinese or Mongolian scholars from the same or closely related discipline. Rarely did collaboration occur between natural and social scientists, as originally intended. And when it did occur (as in my case), collaboration tended to be more logistical than cognitive.⁹ These realities have direct implications for the production of scientific knowledge. In the case of the GEMS project, the international scale of reference helped to structure the kind of disciplinary collaboration that could occur, the kind of research questions that could be asked, the kind of data that could be collected, the levels of funding that could be expected, and the channels through which scientific information could eventually be disseminated. To observe some of these connections, it is necessary to move into the national and local frames of reference.

Chinese National Scale

The intellectual oppositions that exist at the international scale (between natural and social scientists) are compounded at the national and local scales by fundamental oppositions between Chinese/Mongolian perspectives and outsider/insider perspectives. These oppositions are

ideological, institutional, and behavioral and point to direct linkages between scientific authority and political power. The scales obviously blur together, but it is quite possible to identify the broad national tensions in China that help to contextualize the everyday oppositions played out under local circumstances.

In China, all grassland research occurs within an operative ideological framework—a political discourse—that helps to structure the scientific investigation of nature in arid zones. It affects how scholars and officials gauge the scope and severity of degradation, how they spin a national narrative about the causes and culprits, and how they direct public interpretation of desert land. Chinese government officials and scholars widely attribute land degradation to past and present anthropogenic forces. Though climatic and physical processes first formed the deserts of China, they believe that humans have contributed tremendously to their enlargement. Population pressure constitutes the general explanation. But whenever discussion of human causality becomes more specific, the rhetoric heats up.

Chinese officials and scholars typically deflect responsibility for environmental problems away from anyone associated with the current political regime. This is accomplished by diverting blame in either of two directions: one in space, one in time (both toward the “Other”). The spatial strategy is to place blame on local (minority) land users, whom Chinese officials and scholars routinely portray as ignorant, irrational, backward, or uncooperative. The temporal strategy is to lay responsibility at the feet of previous (irresponsible) governmental regimes, especially the Qing, the Nationalists, and the Maoist zealots.

In this analysis I am primarily concerned with the deflection of blame toward local populations. Chinese discourse often invokes a cultural element to explain both past and present degradation of minority lands. Han Chinese officials and scholars widely criticize Mongolian pastoralists for holding to traditional, “rely upon heaven” (*kaotian fangmu*) methods of production. They argue that Mongols never concerned themselves with grassland preservation under the mobile conditions of their past. Mongols (supposedly) never learned to look beyond their sheep to the soil, so today they have no regard for the land that farmers have long cherished. Influential officials at both national and regional levels of government explicitly expressed this viewpoint to me during interviews.¹⁰

Grassland officials working in the Chifeng district of Eastern Inner Mongolia also focus on local cultural issues to explain the degradation process. For example, the 1993 annual report of the Wengniute Banner government listed both “maladaptive thinking” and “lack of initiative” as two of the greatest problems facing regional development (Wengniuteqi Renmin Zhengfu 1993:7). Recent regulations explicitly call upon household contractors to pursue principles of scientific planning (*kexue huafen*), energetic construction (*dali jianshe*), vigorous protection (*jiji baohu*),

and rational utilization (*heli shiyong*) (see Chifengshi Caoyuan Jianlisuo 1990:7–8; Wengniuteqi Renmin Zhengfu 1988:1). Such exhortations are based upon the premise that principles of conservation and initiative are basically absent among minority populations.

Chinese natural scientists working in pastoral areas generally endorse the government's negative caricatures of grassland culture and typically attribute the causes of land degradation to local misbehavior. According to Zhu Zhenda, one of the foremost authorities on desertification in China, natural causes account for only a tiny percentage of the current ecological problem. He asserts that

Only 5.5 percent of lands of desertification results from invading sand dunes, the great majority, 94.5 percent, may be described as having undergone desertification in situ initiated by human activities. According to field observations, overcultivation, overgrazing and fuel gathering each shares 25.4, 28.3 and 31.8 percent respectively, whereas misuse of water resources, road construction, and urban and industrial development are responsible for a total of 9.0 percent. [1990:70]

In other words, this formula holds rural peasants accountable for as much as 85.5% of the national problem, while the state and urban industries are accountable for only 9%. Similarly, the China State Council (1994:181) asserted in the government document prepared after the 1992 Earth Summit at Rio that "the formation of desertification in China is the results [sic] of over-cultivation, over-grazing and destruction of vegetation." This statement, designed for international consumption, merely reiterated a conventional formula that pervades Chinese scholarship (see Ba Gen 1993; Hu Mingge 1990:204–207; Zhu and Wang 1990). Other Chinese natural scientists are even more explicit in their cultural critique. For example, an influential research professor at the Institute of Applied Ecology in Shenyang (and a vocal participant in the GEMS conference) presented the view that "lack of development in the area is due to deterioration of the ecological environment, a lower level of culture, technique and productivity" (Zhao 1992:2). Many others insist that environmental restoration can only begin once "primitive" minority practices have been abolished:

The traditional pasture system that relied entirely on "heaven" should be abandoned. Sophisticated farming techniques should be employed to improve pastureland and to cultivate supplementary feedstuffs. . . . In short, economic development and environmental quality will change to a higher and higher standard. [Zhao 1990:270]

Chinese social scientists working in pastoral areas also generally endorse the government's negative caricatures of minority culture, although they tend to employ a more nuanced language. For example, a scholar from the Institute for Rural Development in Beijing wrote, "The pastoralists are often said to have little understanding of the delicate ecological balance of the pasture land. As a result of this

ignorance they allow their pastures to become overgrazed" (Lin 1990:88). Fei Xiaotong, one of China's most prestigious sociologists, publicly argued that although the colonial influx of Han cultivators into pastoral areas did indeed accelerate land degradation, native herders would only benefit over the long-term because they are now compelled to manage the land and control their environment more carefully (Fei 1984). Likewise, a sociology professor at Beijing University (and a participant in GEMS) has generally downplayed the violence of Han assimilation policies (including land reforms) and ongoing ethnic tensions in Inner Mongolia. For example, his early reports from the village of Sanyiefu in Wengniute Banner of Chifeng concluded that

No major conflicts have occurred between Han and Mongolians in the past sixty years. In all the periods: "cooperative transformation", "commune system", "responsibility system", even during the "cultural revolution", Han and Mongolians have seemingly gotten along very well. . . . Under this kind of situation, ethnic identity as well as native-migrant [issues] are minor concerns. [Ma n.d.:28]

In another report from a different Mongolian village study, he and a colleague reported that "System reform in the 1980s brought some tremendous changes in migration and livestock production patterns. These changes are quite positive for the environment in grassland areas" (Ma and Li n.d.:13). Such rosy commentary about such disruptive events among such poor and historically subjugated peoples tends to support the consistent political message that Mongolian pastoral culture requires intensive administrative control from the state.¹¹

To summarize, a pervasive Chinese national discourse considers the mobile herders of Inner Mongolia and their arid-steppe homeland to be long-standing obstacles in the path of economic development, scientific rationalism, and national progress. From an urban Chinese perspective (incorporating both natural and social scientists), the degraded grasslands epitomize an alien land and people that stand "in the way" of modernization—obsolete and disposable in their traditional constitution. They are both seen as peripheral externalities that threaten the integrity of the center. Thus, recent policy initiatives (informed by grassland science) attempt to turn an extensive system of open-range grazing into an intensive "scientific" production regime based upon enclosed pastures, irrigated forage production, stall feeding, machinery, improved breeding, and chemical fertilizer. The policies basically attempt to reproduce the spatial and ecological regimentation of Han farmland upon Mongol rangeland (see Williams 1996a).

Chinese grassland scientists and officials strongly support rangeland parcelization and the proliferation of household enclosures. The following statement is representative of conventional wisdom on the subject: "Grass yields have been doubled or quadrupled merely by fencing the original

pasture. . . . Productivity will be enhanced if pasture improvement and scientific management are put into practice" (Zhou 1990:44). Similar praise can be found in virtually any Chinese account of grassland problems and solutions (see Chang et al. 1990; Fei 1984; Hu 1990: 210–11; Wang et al. 1993:31).¹²

It is especially noteworthy that the work of grassland reconstruction in China is usually contextualized in the language of scientific modernity. For example, regional government positions are typically filled by officials explicitly "qualified" in science and technology, and there are thousands of rural households advantageously classified as "scientific households" (Hurelbaatar 1996:167). Also, media reports like to show how advanced technologies are utilized to dispel the ancient threats of sand drift that menace more backward peoples. Aerial seeding is a prominent weapon in this propaganda campaign. For example, successful aerial seeding in one arid region was announced in newspapers as a great breakthrough, made all the more impressive by surprised foreign experts who had believed it was not possible (*China Daily* 1988). Likewise, afforestation projects achieve greater public support by invoking an aura of technological sophistication. One scholar's report boasted:

The composition of [the] shelterbelt forest system was based on countless laboratory experiments involving computer modeling and wind-tunnel tests. As a result, the shelterbelt forest was planted in a configuration designed to provide optimum protection for vegetation and the surrounding environment. [Jiang 1994:18]

Through such rhetorical devices, Chinese grassland policies and scientific investigations are designed to wage ideological battle and assert political control over public perception as much as they are intended to prevent ecosystem decline.

Mongolian Local Scale

Local residents of Mongol ethnicity do not typically endorse the national Chinese discourse. They perceive their environment, their land use, and their lifestyle rather differently from the Han. Indeed, many herders are quite vocal about their opposition not only to national rangeland policies, but also to grassland scientists and the institutions of grassland science. At my fieldsite, there was ample evidence of such tension. I begin with opposition to policy.

A central problem with the Chinese scientific literature on enclosures is the continued assumption that grassland experiments conducted under controlled conditions can be broadly replicated in poor pastoral villages. Most Chinese rangeland scientists simply do not consider the social context of implementing their enclosure recommendations. They typically address the issue of enclosures as if the only relevant question could be: does long-term fallowing

restore the net primary productivity of rangeland vegetation? Their studies show (unsurprisingly) that it does. But the studies do not indicate where and how the livestock should graze in the meantime, or how independent households will coordinate their rotational grazing, nor do they indicate how capital will be acquired, or what will happen to households that prefer not to restructure the rangeland according to central government specifications.

Residents do not generally look upon the erection of new fences in neutral terms. Nor do they usually reflect upon enclosures in the benign context of "dune fixation." Rather, they tend to reflect in very personal terms about how enclosures will affect their immediate social relations. They correctly understand the fence as a tool of economic exploitation. Those who can afford expensive wire command the largest and most fertile pastures, while those who cannot watch their unguarded pastures turn to sand under constant grazing pressure. Expanding household enclosures have dramatically intensified animal-to-land stocking ratios on highly vulnerable rangeland, exacerbating wind and soil erosion processes across vast territories only to protect small isolated fields dedicated to poorly financed fodder cultivation (Williams 1996b). For this reason, fence construction has precipitated a great deal of vandalism and violent conflict between neighbors. After all, on the crucial issue of economic vitality for each independent household, neighbors who enclose land are just as threatening as Han scientists who enclose land. I know of many incidents where residents brutally attacked their neighbors and trespassing livestock over land enclosure disputes (see Williams 1996a:684–686).

Local residents also correctly understand the fence as a tool of external control. They know that enclosures impose restrictions upon themselves as well as the livestock. For example, Chinese scientists increasingly assume the authority to set parameters of household production. The following quote is illustrative:

Scientific research can determine the optimal number and type of animals to graze in a particular area, during a particular season and period of time. . . . a rational rangeland management system, coordinated by central and local government agencies and backed by regulations and policies, is required to make sure that each rangeland area is properly utilized. [Zhang 1992:49]

Furthermore, the prosperity of an entire region can rise or fall with scientific pronouncements over production potential that influences the relative size of government investments. For example, some scientists now favor investments in southern and western grasslands over those of arid Inner Mongolia (NRC 1992:140). The influence to control large populations and to shape regional prosperity are obvious manifestations of the increasing political power of grassland science in China. It is no wonder then that the majority of residents feel vulnerable and resent

some of the transformations set in motion by government policy.

The unpopularity of grassland policies only increases local opposition to Han scientists and their practice of grassland science. In Nasihan, Mongol herders perceive the scientists as outsiders who threaten the integrity of traditional identities. First, there is much anger directed toward the itinerant scientists as individuals. Locals interpret the research station primarily as a boondoggle. They believe that little has been accomplished after twenty-five years of intervention and great expenditures of capital. In the words of one elderly resident, "only about five years have been beneficial for the community, the other twenty years have been a waste." Many people claim they could personally do a better job if given just a fraction of the funds. Some even charge the scientists with making bad conditions turn worse. For example, they mock them as idle tourists (*keren*) who hoard the best lands for their own gardens and nurseries, living quarters, and experimental fields: "they came to control the desert; shouldn't our guests live out amongst the moving dunes rather than in the lap of luxury?"

Others criticize the Han scientists not only for mismanagement, but also for ethical improprieties. They charge them with various forms of economic exploitation and opportunism. For example, the research station often hires local workers (including children) at a meagre wage to provide much of the physical labor required to maintain the grounds, to carry equipment, and even to collect and record field data. The scientists also participate in the local economy by purchasing livestock, which they entrust to local herders for years at a time. This leads to unpleasant confrontations (which I witnessed) when the absentee owners suddenly appear and demand full accounting for the herd and its natural increase. In one incident, a junior station manager directed a crew to the crumbling mudbrick home of a young man who had contracted some three years earlier to shepherd a flock of sheep and goats (the number of which technically exceeded grassland regulations) on behalf of the scientific community (to be used primarily for mutton to lavish upon visiting delegations). When the herder realized the crew had come without warning to assert ownership of his entire flock he slowly worked into a threatening rage that sent the crew into hasty retreat. The matter was quietly dropped a few days later after some of the herder's influential kinsmen expressed their protest to members of the research station support staff. It was also reported to me by credible informants that some members of the scientific community had even engaged in the trade of local livestock, buying low in the village while selling high in the cities to gain personal profit. If true, this suggests that at least some members of the scientific community were engaged in explicitly illegal and immoral practices. They were essentially gambling with government finances for secretive private profits, while diverting their

resources and their labor from the needs of the community in order to compete with local herders on the market. For these and other such criticisms, most of the residents would like to see the station closed down.

There is also animosity directed toward grassland science in general, which takes both passive and active form. In polite conversation, local residents all repeat formulaic praise for scientific methods of production. Yet the vast majority of them quickly admit that they are not scientific practitioners. They verbally praise the ideal, but feel content to persist in their "backward" traditional ways. When challenged to explain this contradiction, residents eagerly defer such conversation to their local "model" citizens. These are individuals from the herding community who are praised by the scientific community and local government institutions for "exemplary" production techniques. In exchange for this ideological service, they enjoy a wealth of special privileges, including political clout, production tutelage, bank loans, and enhanced grazing and mowing rights. Local herders are willing to praise these token households for production practices that they personally have no intention of adopting, apparently for the insulating cover it provides them from the scientists.

Even many of the "model citizens" find it advantageous to appease the scientists in conversation while ignoring their instruction in practice. I had the opportunity to observe the process by which the scientists sometimes affirm their work in the community through a combination of intimidation and sociological naivete. For example, early in my fieldwork I witnessed a brief but interesting encounter between members of the research staff and a successful local resident named Hai Li. The scientists were returning to the research station from a morning of field work when they stopped their truck along the road to offer a ride to Hai Li, who was burdened with a sack of grain. Hai Li accepted the ride and sat quietly until one female scientist decided to conduct a brief interview, apparently to demonstrate significant "facts" of local production to me. The scientist made several lengthy statements about the importance of enclosure and the utility of scientific planning and then paused to ask Hai Li whether he did not agree. Surrounded by research personnel and holding his cargo to his chest, Hai Li offered a single utterance before he jumped out of the cab: "Certainly." The interviewer later turned to me and asserted, "See, the residents really support our work . . . did you hear what he said?" I could only respond that the words of praise had all come from her own mouth.

As I gained more access into the community, I observed much more active forms of opposition to grassland science. For example, herders do not usually implement the new rangeland policies as intended. They do not follow a wide range of enclosure specifications, including the primary injunction to keep livestock contained within household fences. They generally do not sub-fence their land, or

practice coordinated rotational grazing. Some individuals still cut down trees for timber, uproot sod for housing, and cultivate gardens in excess of 30 mu—all illegal activities under national grassland regulations. There is also much vandalism explicitly directed at research station property and science equipment. In particular, fence-wire from prominent experimental plots is frequently stolen and weather recording instruments are damaged. Even more threatening to the practice of local science, there is much deliberate human and livestock incursion upon the enclosed fields where scientists conduct their research experiments. Angry that so much land has been taken out of production for so long to serve as an experimental control, herders frequently graze and mow vegetation within these boundaries. In so many ways, local residents literally contest the rigid walls of separation that grassland science has erected to reproduce fundamental social hierarchies in China.¹³

Mongol herders also directly challenge the scientific authority of grassland science. For example, they argue that the grasslands are more resilient than the Han scientists know. They believe the worst degraded pastures can be restored to productivity (with no labor) within a mere three years' time. They also insist that good grazing requires landscape diversity and mobility across large areas. For this reason, they express strong disapproval for the recent proliferation of fence-wire in the region—even the elite households who gain economically from the enclosure movement. Contrary to the scientists, Mongol herders expressly value the various contributions that dune sand makes to their pastoral economy. They prefer indigenous breeds of sheep to exotic species, and despite explicit grassland prohibitions, they refuse to abandon or even limit their goat husbandry. Herders also denigrate grassland science on grounds of ineffectuality. They complain that farmers enjoy the benefits of improved varieties of rice seedlings while they must do without drought-resistant fodder crops. They ridicule aerial seeding as impractical and a waste of resources. They consider artificial insemination to produce weak and sickly animals. They perceive no meaningful government investment in the pastoral livestock sector. Indeed, they point to the hypocrisy of government officials who sound the alarm of degradation yet continue to resist substantial investments in the land and its people. In short, they not only reject the Chinese national discourse that would scapegoat Mongol herders, but they also explicitly blame Beijing for causing (through colonialism) and perpetuating (through neglect) the land degradation that jeopardizes their livelihood.

It should be noted briefly that anti-scientific sentiment comes rather easily to residents of rural China. In part, this is another legacy of the radical Maoist era. In the late 1950s, Mao adopted the teachings of Lysenko agricultural science, which simply dismissed genetic theory. Believing that class ideology permeated both nature and society, Mao

instructed farmers to plant rice seedlings virtually on top of each other to increase production. He believed that crops from the same "class" would not compete for light or food, and thus he set the nation on a course for massive famine (Becker 1996:68). Also, the Chinese Communist Party filled thousands of scientific research institutes with untrained peasants, while professional scientists were imprisoned or sent to do manual labor in the countryside. The so-called barefoot scientists falsely reported some incredible achievements in agriculture, like cross-breeding Holsteins with pigs to produce enormous animals, or tomatoes with cotton to produce red clothing material (Becker 1996:62–63). The long years of the Cultural Revolution a decade later reproduced these dramatic social inversions.

This is the historical context of the years just prior to the arrival of Han scientists in Inner Mongolia. Local residents know all too well how Chinese political ideology can inform the practice of science and the construction of scientific knowledge. They have been trained to be skeptical about scientific authority. For this and the great variety of other reasons already discussed, Mongolian herders tend to see their own interests in direct conflict with the community of grassland scientists. The Han scientists are not unaware of these realities. They know they work in antagonistic relationship with local residents, but they perceive the various expressions of resistance as further evidence of the "backward" pastoral culture that keeps the region degraded and impoverished. Every negative encounter with the local population simply reconfirms the scientific and official discourse that scapegoats local land users.

It should also be noted briefly that the oppositional Mongolian perspective that I encountered among local herders in Nasihan is reinforced in interesting ways by urban-oriented Mongolian intellectuals. The MacArthur EC-CIA project apparently involved many such individuals, and recent publications provide an opportunity to ascertain their perspectives. In general, such authors work to mediate some of the ideological tensions I have already mapped out. That is, they attempt to undermine the popular Chinese view that Mongolian pastoralists destroy the environment, yet they also seem concerned not to romanticize or defend all local land use practices as ecologically sound (as I have also labored to do here and elsewhere).

For example, one collaborative article reports research on attitudes to nature in Mongolia and Tuva (within the Russian Federation) which shows that "concern for the environment is one of the most important issues for rural people" (Humphrey et al. 1993:51).¹⁴ The authors quote herders saying respectful things about the environment like "everyone understands you shouldn't take a lot from nature or nature will take revenge on you" (1993:54). They also quote herders saying conservative things about technology like "We consider that it is better not to trick and not to make experiments. The best method is to rely on the experience of our ancestors. . . . we are quite conservative in

this respect and we rely only on the laws of nature" (1993:56). In this way, the authors not only contradict the negative caricatures of herders typical in Chinese discourse, but also reveal how local herders actually invert the stigma of technological backwardness and reproduce it as cultural reverence for the natural world. The authors also explicitly discuss how indigenous herders develop a blindness to their own pollution and exaggerate the pollution caused by tourists and other incoming ethnic groups (1993:60).

Tseren (1996) argues that Mongolian pastoralism involves an ecological lifestyle, characterized by various special values, taboos, and conservationist practices that exert control over human activities that might harm the environment. He compares Mongolian pastoralism quite favorably with more industrialized economies that cannot so easily resolve the contradictions between development and natural degradation. Erdenijab (1996) argues against the Chinese national discourse that blames local populations for circumstances beyond their control. He writes, "Pastoral degradation and the increasing conflict of interest between animals and pasture are concrete and pressing problems in the process of economic development. . . . But behind all these stand causes derived from economic theories and the state's economic policy" (p. 194). Likewise, Chen Shan (1996) blames most of the region's environmental problems on the Chinese obsession with converting grassland to cultivated fields. He writes, "Thanks to two large-scale land-opening campaigns conducted between 1958-62 and 1966-73, Yekezhu League opened 600,000 hectares of grassland, which led to 1,200,000 hectares of grassland being desertified. The pattern proves the maxim, 'Destroying grass to open land harms both agriculture and pastoral production'" (p. 114).¹⁵

It is not my intention to map thoroughly all the relevant scholars and all the ideological perspectives that can be gleaned from the available literature. I have offered these few examples because they suffice to support my essential point that local communities of Mongol herders do share and communicate vernacular representations of nature that can be contrasted with the mainstream perspectives of urban Chinese Nationalist intellectuals.¹⁶

Discussion: Connecting the Scales of Analysis

The existence of ideological and institutional tension at all three scales significantly conditions the ongoing production of scientific knowledge in China. At this point, I am interested primarily in how the three scales fit together to amplify (rather than minimize) the relevance of local circumstance. In other words, incongruities of perception and tensions of interpretation that exist among actors at international and national scales get played out at the local level with greater repercussions than what might be expected from cases where knowledge is constructed only at

local or even national scales. I argue that oppositions within the scientific community at the international scale help to conceal the oppositions that exist at the national and local scale and thereby promote their real significance. Concealed oppositions make it easy for the Western scientist (especially the natural scientist) to be unaware that alternative representations of nature even exist in Inner Mongolia. The structure of engagement with local data generally compels them to endorse rather than challenge the Chinese discourse concerning the causes and culprits of land degradation and the policies considered necessary to control them. I witnessed this process in operation, as the research station hosted many international delegations during my year of residency.

Natural scientists from Western nations (and Japan) almost invariably rely upon Han scientists for access to practically all field data. They do not speak local languages and so receive their critical orientation primarily through the filter of translation. They do not stay long enough to explore beyond a pre-designated tour route. They gain no access to those in the community who dispute the research station's version of reality. Even if they do come across such people, they hear nothing unorthodox, for want of time to establish a trusting relationship. But then they do not usually seek out local inhabitants because they perceive no need. Western scientists naively consider their hosts to be the "local expert," even though Han scientists see themselves as outsiders who work in an alien environment among alien people. Undoubtedly, Han scientists do develop an identifiable expertise through their laborious field research. I do not argue that all of their data are contaminated or that they have no valid perspective by which to interpret ecological change. But their experiences and knowledge base must not be construed as "local," "insider," or "native," given the colonial history of Inner Mongolia.

Through such grassland tourism, local power relations and their effects on knowledge production remain largely invisible and irrelevant to foreign scientists. I was astonished that delegation upon delegation completely endorsed the Han perspective and the full range of national grassland policies by the time they left the research station. Their comments generally conformed to the sentiment explicitly communicated by one European scientist, "The work of the research station perfectly matches the needs of the local community." I also witnessed how the collection of scientific data for international consumption could completely erase all traces of antagonistic social relations in the township. This observation struck me especially hard, for example, when I helped to gather tree-ring samples for analysis of climate change by GEMS participants abroad. I participated directly in the effort of the research station personnel to procure the requested samples. We drove to the edge of a large collective hayfield where several

hardwood trees more than one hundred years old had been felled recently through ambiguous circumstances. It is illegal in the grasslands to cut such trees without permission from the county level (Banner) government, but since the trees were down, village level authorities auctioned away the rights to the wood to local residents at the price of about 80 yuan per meter. The research personnel and I labored for hours with a cross-saw to cut away about a meter of trunk from each base of four different trees. In short, we simply confiscated the wood for tree-ring samples from an illicit harvest of grassland resources, essentially imposing a scientific tax on the individuals who had purchased the rights to the lumber (under questionable legal proceedings). As we hauled away our samples in a truck someone remarked, "after the logs dry in the sun a few days, no one will even notice that we cut from them." Of course, the incident will have no effect on the results of the scientific analysis, but it helps to illustrate the social context in Nasion, where even the most objective scientific knowledge is often gained through confiscation of local resources and unequal relationships of power in rather chaotic circumstances that find no place for expression in laboratory reports.

Ultimately it matters to the construction of scientific knowledge that problems of interdisciplinary collaboration at the international scale lead to Western natural scientists working exclusively with Chinese natural scientists in a minority field setting. Unhealthy dependencies are easily created that distort data collection and close off opportunities to engage an alternative knowledge base. It matters if Western scientists tour research enclosures to monitor the success of dune fixation without any knowledge that such enclosures are fiercely contested (and vandalized) by the residential community. It matters if they concern themselves with land degradation and resource development but never learn that Mongol herders have their own (conflicting) definitions of these concepts. It matters if they visit local households to evaluate community needs without knowing those individuals to be "model citizens" who are engaged in well-rehearsed (and duplicitous) role-play. It matters if they utilize ecological and weather data that were collected and recorded at the hands of local workers who feel exploited by (and hostile to) their absentee urban employers. All of this matters, first, because the field data are probably wrong and/or incomplete and/or significantly context dependent. It matters, second, because the process enables an imposed vision of reality and representation of nature (that is antagonistic with local visions and representations) to become, with unwarranted authority, further entrenched. It matters, third, because the process prevents dialogue between competing knowledge systems that must occur in order to improve understanding of environmental transformation.

Of course, the problems of distortion and bias that can affect data collection are not limited to the practices of

natural scientists. They also deeply condition the work of social scientists. I am willing to concede that my own perceptions of local opposition to the research station could have been exaggerated by the conditions of my fieldwork. For example, I was amused by the way local people consistently demanded to know how much I paid the research station for daily room and board. When I responded, they invariably expressed shock and dismay that the Han scientists would exploit me so terribly for cash. They perceived my "exploitation" as analogous to their own. It opened the door for them to identify with me as an actor who had interests separate from the research station, and then to launch into a critique of the work of the Han scientists. In other words, in subtle ways I was being manipulated by local inhabitants in the opposite direction (with regard to the national discourse on land degradation) from the way visiting delegations were being manipulated by personnel at the research station and urban officials. I was influenced to be critical of post-reform grassland policies just as other foreign scientists were influenced to endorse them. No doubt, had my research been structured differently at the international scale, the data that I collected and my interpretation of it would most likely also be different.¹⁷

Clearly, I do not intend to privilege the neutrality of the social scientist over the natural scientist. I have emphasized the credulity of natural scientists in China only because I was in a unique position to observe their manipulation, and because they tend to be less likely to admit the interpretive (and site-specific) dimensions of scientific knowledge production. We must all take more seriously the influence of local circumstances in shaping scientific inquiry and the construction of data. The sustained intellectual dichotomy between cultural landscape and natural landscape carries adverse practical consequences for scientific investigation.

The arguments presented here should not be construed as an attempt to reject scientific practice. On the contrary, they underscore the need for carefully chosen research strategies and the importance of persuasive evidence. The arguments are, however, intended to help indict the pernicious and all too widespread practice of scientism—the arrogant assumption that scientific knowledge necessarily exists as objective fact, independent of social and institutional context. Ethnographic fieldwork helps to demonstrate that contending social values and institutions are often the most essential facts to consider. As Thompson and Warburton (1985) have persuasively argued, "it is institutions—the value-determined choices of fact—and not simply the facts themselves that we must deal with when we seek to promote the sustainable development of a region that, like it or not, is awash with uncertainty" (p. 134).

Ultimately, this study revives significant questions about the nature of "discourse" and the relationship between empirical evidence and ideology. Are discourses mere fictions produced by the political interests of different

social groups, or do they reflect more tangible realities of experience? I am inclined toward the latter view, and optimistically believe that at some level there does exist a willingness on the part of different knowledge communities to listen to each other. Significant progress in resolving real-world problems can be initiated simply by exposing the competing knowledge bases that otherwise remain concealed. As Dove (1986:136) has suggested, "when a more sociological approach enables us to distinguish between disguised conflicts of interest and genuine development problems, the latter are found to be far less intractable than imagined." The practices of scapegoating local populations, ignoring their preferences, and dismissing their perceptions through the guise of an objective and rational science does not advance the cause of development or science.

Notes

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1. All of these authors emphasize some aspect of the social construction of reality, although they hold a range of different views about the prospects for objective scientific practice.

2. To my knowledge, only one scientist was a member of an ethnic minority group (not Mongolian) within China.

3. Near the end of the Qing Dynasty (the late 1800s), government officials were eager to alleviate mounting political instabilities that resulted in part from widespread famine and hunger for land. Incrementally, they allowed Han farmers migrating from the interior to settle onto peripheral rangeland under the authority of a government policy to "construct the frontier." The influx intensified after 1911, when the new Chinese Republic declared that all Mongol territory belonged to China and that land titles were henceforth invalid unless ratified by local Chinese authorities. After 1924, when railway lines were extended, the floodgates opened. The population of Inner Mongolia in 1912 was a little over 2 million with roughly one Han to every Mongol, but by 1990 the total population rose to 21 million, with a ratio of 6 Han to every Mongol (Ma 1984:111).

The migration policies gave teeth to a traditional Han perspective that any frontier lands that can be productively cultivated rightfully belong to the Han. Throughout the Maoist era, national campaigns further reduced the amount of fertile grassland available to minority pastoralists. For example, Inner Mongolian herders lost 21% of prime rangeland to agricultural production between 1953 and 1979 during the "grain first" policies of the Great Leap Forward and the Great Proletarian Cultural Revolution (Longworth and Williamson 1993:305). Mongol leaders who denounced these aggressive campaigns in areas unsuitable for rainfed agriculture were

arrested and/or demoted (Jankowiak 1988:272; Sneath 1994:419). The Cultural Revolution especially unleashed a frenzy of mob violence and public paranoia directed specifically against ethnic Mongols that resulted in a great persecution and slaughter. The estimated death toll ranges from 10,000 to 100,000, while some 300,000 Mongols were accused of fomenting nationalistic aspirations of independence (Sneath 1994:422).

4. When social research is conducted by foreigners in China, it is more typical that the host institution is affiliated with the Chinese Academy of Social Sciences (CASS). In such cases, Chinese research assistants are often assigned to escort and intervene, should the scholar stray from an approved agenda stipulating permissible destinations and interview questions. In contrast, my host unit (the Chinese Academy of Sciences) had no clear operating procedures to monitor the work of social scientists. This permitted me an unusual degree of autonomy, especially in the field setting where I was free to work under my own discretion, often for weeks at a time without any of the scientific staff being present.

5. The most basic concerns we shared were to help control extensive soil erosion in the region, to help alleviate widespread poverty, and to help facilitate communication between officials, scientists, and local residents. The process of working toward these common goals made us allies more often than not. For example, we worked together to overcome many logistical and institutional barriers to make my visit possible in the first place. On top of that, we jumped even more hurdles to allow my wife and baby to join me for several months of fieldwork. Severe weather and the general impoverishment of the region frequently imposed emergency conditions upon us that further strengthened our mutual comradery—we traveled together (perilously) through floods, snowstorms, duststorms, and mudslides; we shared personal resources like food, gasoline, batteries, medicines, toilet paper, baby clothes, and even sleeping quarters; and we entertained each other through sports, stories, songs, and the consumption of alcohol.

6. Given the contrasting physical, historical, and social circumstances of Mongolian herders in Russia, Mongolia, and China, we should not necessarily expect uniform land use strategies across the steppe. Yet it is reasonable to expect some coherent agreement about fundamental goals, such as optimal herd size, frequency of movement, range of movement, and appropriate management institutions.

7. I have consciously adopted a framework that differs from the "actor-network" model increasingly prevalent in Science and Technology Studies. The international, national, and local scales explored here are certainly interconnected and somewhat arbitrarily drawn, yet I believe they are appropriate for this exercise precisely because they continue to be instrumental in reproducing and reifying important social constructions (perhaps especially in places like China where state organs still dominate ideological and economic parameters).

8. I can only relate the circumstances of my own research experience in China. Participants of other collaborative efforts can speak for themselves. I intend no specific evaluation of their own successes or failures.

9. I entertained elaborate discussions over the year about concerns such as meal preparations or housing and travel

arrangements, but my hosts asked very little about the nature or the progress of my work.

10. Guo Yong, Vice Governor (*fu qi zhang*) of Wengniute banner, interview by author, September 3, 1993. Li Yutang, Executive Vice President of China Pratacultural Association and Senior Economist for the Ministry of Agriculture, interview by author, June 5, 1992.

11. Chinese social scientists working in the northern grasslands have not yet (to my knowledge) articulated any clear distinction between their own perspective on minority cultures and that of outspoken government officials and natural scientists. But the social sciences are still young in China, and scholars who work in sensitive border regions with minority populations are especially vulnerable to government surveillance and pressure.

12. A notable exception is found in a report by Liu Yuman (1990:97–100), at the Institute for Rural Development in Beijing, who explicitly recognized the relationship between expanding enclosures and grazing pressure intensification in surrounding grasslands.

13. It is reasonable to conclude that many local residents currently engage in a variety of activities that appear destructive to the grassland ecosystem. These activities, however, are forms of cultural and political resistance to a new environmental regime imposed upon the community from outside (see also Hess 1995; Scott 1985). The destruction is driven not by deficiencies of tradition (as the national discourse would have it), but by poorly managed transition in the wake of new national rangeland policies that (upon the authority of grassland scientists) promote the privatization and parcelization of common property resources.

14. At the time of publication, Marina Mongush was Head of the Department of History and Ethnography in the Tuvan Institute of History and Culture in the Academy of Sciences. B. Telenged worked in the Research Institute of Animal Husbandry in Ulaanbaatar, Mongolia. Caroline Humphrey was affiliated with the Mongolia and Inner Asia Studies Unit at the University of Cambridge, Great Britain.

15. At the time of publication, P. Buhan Tseren worked at the Research Institute of Animal Husbandry Science in Urumchi, Xinjiang, China. E. Erdenijab was affiliated at the Research Institute of Animal Husbandry in Ulaanbaatar, Mongolia. Chen Shan served as vice president of Inner Mongolia Normal University in Hohhot, China.

16. My broad categories of analysis (social/natural scientist; Chinese/Mongolian/Western; urban intellectual/indigenous herder) necessarily involve some generalizations that conceal underlying heterogeneity. For example, while there may not be absolute consensus among all Chinese natural scientists about how they want to represent nature on the Mongolian steppe, nevertheless a conventional view is clearly discernible in their writings and spoken comments. I believe the same argument holds for the other idealized types presented here. It is a facile and errant critique to respond to this analysis by simply insisting that such oppositional categories are too broadly conceived. Some oversimplifications of reality are necessary to present an explicit and comprehensible argument.

17. The language of "influence" and "manipulation" is not intended to mask the personal agency of all individual actors involved in the construction of scientific knowledge. After all,

there are obvious ideological and institutional rewards for endorsing the conventional wisdom and pursuing the standard fieldwork strategies of one's profession. It is possible that officials and scientists (both domestic and foreign) deliberately filter their observations and obfuscate the local impact of household enclosures precisely because they have so much to gain from a lack of clarity. The status quo serves powerful political interests by reproducing a national and international consensus about Chinese grasslands that affirms the accomplishments of the reform era, the benevolence of the Chinese state, and the superiority of Han civilization. Still, I do not wish to impute sinister intentions where they may not exist. On the other hand, I do not mean to suggest that all perspectives are equally valid. I obviously believe that long-term ethnographic fieldwork yields a more accurate assessment of policy impact than intermittent grassland tourism.

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