

METEOROLOGICAL KNOWLEDGE AND ENVIRONMENTAL IDEAS IN TRADITIONAL AND MODERN SOCIETIES: THE CASE OF TIBET

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Modern environmental knowledge differs from traditional environmental knowledge in being thoroughly quantitative. We exemplify this difference by comparing modern meteorology with traditional Tibetan knowledge about the weather. Modern meteorology understands the weather as a system of global, quantified interrelationships, whereas traditional Tibetan knowledge about the weather relates it to a system of local, qualitative interrelationships of humans and spirit powers. Against this background we examine recent Tibetan claims about their traditional ecological and conservationist concerns. We argue that these claims are anachronistic projections of environmental ideas belonging to a modern knowledge tradition unknown to ancient or traditional Tibetans – or to any other similar society.

Introduction

Over the last twenty-five years various non-Western peoples have claimed that they have always lived in harmony with nature. Indigenous peoples of the Americas, Australian Aboriginals, Indian Hindus and Arab Muslims, for example, have emphasized their traditional world views and value systems as the basis for an environmentally friendly life-style. These claims are often phrased in the modern scientific language of ecology and environmentalism, invoking terms such as sustainable development, ecosystem and environmental protection.¹

In this article we examine some recent Tibetan claims to such traditional, ecological wisdom. We argue that these claims are anachronistic in that they are projections of ideas of nature which belong to a modern knowledge tradition unknown to the ancient Tibetans. We do so by comparing the general characteristics of modern environmental, 'ecological' knowledge with salient features of 'traditional' Tibetan environmental knowledge. For practical reasons we shall limit ourselves to one aspect of the natural environment, and focus specifically on knowledge about the weather.

Before we proceed, we shall first clarify a few points. Although we are interested in ideas about the physical environment, we wish to avoid using the concept of 'nature'. It is so closely linked to Western traditions of knowledge that it is difficult to employ in cross-cultural research, and even within the Western tradition itself the term 'nature' is highly ambiguous and has a range of meanings which would take us beyond our more modest concern with the environment (Ellen 1996;

Williams 1983). Moreover, the concept of nature, when used to refer to the environment, often suggests too unified, consistent and clearly bounded an object, and so obscures the complexity of people's actual relationship to the natural environment. People experience their environment in a variety of different contexts and rely pragmatically on different sets of ideas which need not be consistent. For that reason we should not separate people's ideas about the natural world from the way these ideas are used in interactions with the environment (Croll & Parkin 1992a: 16; Ellen 1996: 14; Norgaard 1987: 118). Instead of a 'concept of nature', we prefer the less abstract notion of 'knowledge about the environment'. We use 'knowledge' in the open-ended sense suggested by Barth, to refer to 'what people employ to interpret and act on the world: feelings as well as thoughts, embodied skills as well as taxonomies and other verbal models' (Barth 1995: 66). We feel that this usage conveys people's real relationship to the world more accurately than the concept of nature. For stylistic reasons, we cannot dispense with the term nature altogether, but we only use it in the 'neutral' sense of the physical environment.

By 'modernity' we refer to various social forms which appeared in post-Renaissance Europe and, in the following centuries, became influential on a global scale. Industrialism, extended commodity production, nation-states and an increasing application of science are important features of modernity. The movement from pre-modernity to modernity should not be understood in terms of evolutionary stages but as the uneven historical transformation of the world over the last several centuries. There are, thus, no clear boundaries between traditional and modern societies. We contrast modern and traditional knowledge about the environment by saying that the first is predominantly quantitative whereas the latter is not. This negative definition of traditional knowledge is sufficient for our present purpose. We focus on pre-modern Tibet in order to exemplify the absence of quantitative environmental knowledge, but we do not let Tibet stand for all traditional societies and their relationships to the physical environment. We employ an opposition between traditional and modern, but we do not mean to deny the great variation within each of these two categories.

Recent Tibetan claims to ancient ecological and environmentalist awareness

Since 1985, a wide variety of accounts concerning Tibetan environmental knowledge and ecological understanding have been produced by exiled Tibetans and their collaborators.² While it is important to recognize the social and political background to the production of such statements,³ we are primarily interested here in the particular style with which they attempt to portray traditional environmental knowledge. These recent Tibetan statements stress the innateness of a certain type of traditional world view, value system and behaviour, but describe them in modern concepts and language. For instance:

[In Tibet] Buddhist faith dominated everyday life ... Plants, animals and 'inanimate' nature were as important and valuable as human beings to Tibetans. The Tibetans always tried to *preserve the ecological balance* upon which they felt they depended ... since we [Tibetans] have lived like that for many centuries it has become difficult for us to distinguish between religious practice and concern for the environment (Anon 1995: 3; our translation and emphasis).

We should note how Buddhism, the newly erected central pillar of contemporary Tibetan nationalism, takes centre-stage, as though this religion were the principal source of all Tibetan environmental knowledge and understanding. Some writers claim that Tibetan ecological understandings were almost uniquely profound:

The Tibetan traditional heritage, which is known to be over three thousand years old, can be distinguished as one of [the] foremost traditions of the world in which the humankind [sic] and its *natural environment have persistently remained in perfect harmony* (Yuthok 1992: 1; our emphasis).⁴

Traditional Tibetans are also said to have had a systematic and reflexive 'ecological' awareness similar to that developed by Western scientific thought, and a consciousness of large-scale regional ecosystems:

[We] Tibetans have always been aware of the interdependent nature of this world. We know that ... for most of Asia, Tibet's environment has always been of crucial importance. And so for centuries Tibet's *ecosystem was kept in balance* and alive out of a common concern for all humanity (Atisha 1991: 9; our emphasis).

Buddhism – the principal referent for modern national identity – is often claimed to bridge the divide between past and present. For instance:

Both science and the teachings of the Buddha tell us of the fundamental unity of all things. This understanding is crucial if we are to take positive and decisive action on the pressing global concern with the environment (Tenzin Gyatso 1990: 81).⁵

Before moving on, we should note that these types of Tibetan statements concerning ecological wisdom are unprecedented in Tibetan literature, and employ a vocabulary of key words and concepts (such as 'natural environment', 'nature conservation' and 'ecology') which did not exist in the Tibetan language until they were coined as neologisms to translate modern ideas concurrent with the appearance of such statements themselves.

Modernity, environmental knowledge, and the transformation of time and space

Quantification is a dominant aspect of modern knowledge about the environment. Based on the separation of time from space it is characterized by universally defined systems of measurement and representation. People, things and events are located within standardized and abstract global co-ordinates, grids, networks and systems of time and space which are contexts for the interpretation of the world. Quantification is not only an aspect of specialized, 'scientific' knowledge but is also part of most people's everyday lives. In modernity, large-scale, global and universal categories have, in other words, turned into implicit frameworks for individuals and their relations to the environment. In this sense, the individual is confronted by a globalized world. This is the outcome of a long and uneven historical process: the transformation of the world by new technology, economy and science which began in the late Middle Ages and included the Western global expansion and the industrial and communicative revolutions (Gellner 1993: 3).

In modern societies time and space are abstract and 'external' categories (Giddens 1990; Harvey 1989). In pre-modern societies they were integrated, 'internal', aspects of localized modes of social life. Time was 'embedded', or contained *in* localities. It was linked to work on the land, to rituals, markets and other local, social activities, and to the cycle of the seasons. The Nuer, for

example, had no general or separate idea of time. 'Events follow a logical order, but they are not controlled by an abstract system [of time], there being no autonomous points of reference to which activities have to conform with precision' (Evans-Pritchard 1968: 103). Nuer time was an inherent feature of social life and natural events. Moreover, pre-modern localities were largely unrelated synchronically, and life was organized around 'islands of time within seas of timelessness' (Lash & Urry 1994: 227).⁶ The Tiv, for example, named the weekdays after markets but with no consistency throughout the area they inhabited (Bohannan 1967).

With the introduction of the mechanical clock from the late Middle Ages time began to be 'disembedded' from the pre-modern local settings that had framed it. The clock measured an abstract and uniform dimension of time, which, in Mumford's words, 'by its essential nature dissociated time from human events' (1934: 15) – and 'human events from nature', as Landes has added (1983: 16). Over the centuries time was increasingly 'de-localized', and in the nineteenth and twentieth centuries it became global or universal: first, with the division of the world into time zones based on the prime meridian of Greenwich and, second, with the global standardization of calendars (Dorn-Van Rossum 1996; Kern 1983; Nguyen 1992; Zerubavel 1981).⁷

The creation of universal or global time closely parallels the creation of universal or global space. In pre-modern societies space, like time, related to localized social activities, which were in effect 'place markers' (Scott & Urry 1994: 55). Long-distance trade and migrations were not uncommon, but the locality was the dominant setting of social life. The centuries following the Renaissance saw a global or universal space being created above or beyond the localities as trade, travel and communication expanded and spun a network of extensive social relationships between people with no shared common locality. Western global expansion propelled the charting of the earth that made it possible to produce universal maps. These maps 'in which perspective played little part in the representation of geographical position and form, established space as "independent" of any particular place or region' (Giddens 1990: 18-19).⁸

In the movement from pre-modernity to modernity we can see a change in the relationship between time and space on the one hand and localities on the other. In pre-modernity, time and space are subordinated to localities, whereas in modernity, localities become subordinated to (global) time and space.⁹

Nature quantified: the case of meteorology

To the processes that turned time and space into abstract and global coordinates should be added the close relationship between knowledge production and quantification which played such an important part in the scientific revolution and which created fundamentally new ideas about nature.¹⁰ We shall exemplify the quantification of environmental knowledge by offering a few remarks on the history of meteorology and in particular the role played by instruments. We take the thermometer as our case, but other meteorological instruments might do as well.

The basic principle behind the thermometer had been known as far back as the third century B.C. when Philo of Byzantium described an apparatus that

showed that air expanded or contracted with variations in temperature (Frisinger 1977: 47). Philo and his contemporaries did not, however, see that this apparatus 'really' was a thermometer, because they did not think of temperature (or, more generally, the weather) as something to be measured or quantified.¹¹ They lived in the localized social settings of the pre-modern world, where knowledge about the weather was local knowledge, something founded on shared local experience. We gain a glimpse of this concrete local sense of the weather and climate in the work of the tenth-century Arab scholar al-Muqaddasi, for instance, when he describes the climates of distant places by comparison with those of familiar places:

This is a cold province, except Sijistan, Bust and Tabas-at-Tamr, where the climate is similar to that of the warm regions of Syria-Palestine. The climate of Bactria is Iraqi and that of Merv is Syrian. The winter of Khurasan is milder than that of Haytal. All of the province is dry but not to the same degree everywhere. When the winter in this province is very cold, the summer will be very warm, except at Samarkand, where the summer is pleasant, just like at Nishapur, where the winter, however, is milder than at Samarkand (Miquel 1980: 301; our translation).

In the centuries following the Renaissance, knowledge about the weather became increasingly separated from its local foundations and turned into global knowledge.¹² The invention of meteorological instruments played an important part in that process, because they made it possible to quantify the weather, to break down its various aspects – temperature, atmospheric pressure, humidity, wind force and so forth – into measurable units.

The thermometer was invented in the early seventeenth century (Middleton 1966).¹³ The first thermometers were unsealed air thermometers and they were not very useful because of their wide range of unconvertible scales of measurement and because they were subject to changes in atmospheric pressure. An important step forward came in the mid-seventeenth century with sealed thermometers, based on the expansion of liquids, that excluded the influence of atmospheric pressure. But there was still a long way to go before heat and cold had been thoroughly quantified. Instruments were yet to be standardized and given interconvertible scales, and methods of observation had yet to be defined and – not least – followed. This took time and involved the co-operation of observers, meteorologists and scientific institutions on an increasingly international scale, resulting in the establishment, during the nineteenth century, of a dense global network of observation sites, including ocean-going ships (Feldman 1990; Frisinger 1977).

By the end of the nineteenth century thermometers had spread to nearly all corners of the world and made it possible for people to talk about and relate to a fundamental aspect of the environment, the weather, in terms of a standard and universally understood measure: the degree of temperature relative to some absolute 'zero' point. Helped by observations with thermometers and other meteorological instruments such as the hygrometer, the barometer and the anemometer, the weather was analysed into quantified, comparable data. From the growth of controlled observation followed a new vision of weather and climate which reached far beyond the horizon of local time and space (Feldman 1990: 177). Described in the universal language of numbers and other abstract symbols the weather now existed in a global space, in which knowledge about it was increasingly separated from its previous pre-modern, local setting.¹⁴

Knowledge, representation, and ecological space

Measurements of natural phenomena were one important aspect of the quantification of nature. Another was the development of modes of representation which made it possible to recognize global patterns of nature. One of the first to use graphic representation of complex information about the environment was Alexander von Humboldt (Robinson & Wallis 1967). His invention of the isotherm (in 1817) combined the global space of the universal map with the measured temperature of the global weather. Humboldt spent the years 1799–1804 in Central and South America. He brought along a large number of scientific instruments (Cannon 1978) and collected an enormous amount of data on geography, natural history and economy, which he later published in thirty volumes. Humboldt was in line with the new trends in geography that aimed at describing phenomena as they actually occurred around, and co-existed with, the observer (Nicolson 1987; 1990). With an emphasis on the functional interrelation between all individual phenomena in nature, this approach went beyond the older Linnaean taxonomic idea of the ‘system of nature’.¹⁵ As a plant geographer Humboldt was not interested in arbitrarily isolated taxonomic entities, but in vegetation – in real natural wholes and their relationships to the total physical environment.¹⁶ From this perspective he pioneered the study of the geography of plants, emphasizing how variations in vegetation depended on variations in factors such as altitude, temperature and precipitation. By linking various kinds of environmental information he uncovered global patterns of nature and saw that this global environment was made up of regional systems. The isotherm should be seen in this context.

The isotherm is a contour line that links together on a map all places with the same average temperature. In bringing together geographical and meteorological information – and thus illuminating how geographical factors influence the prevailing temperature – the isotherm helped to initiate detailed studies of global and regional weather patterns. By drawing isotherms on a global map one could see that the distribution of continents and oceans had major effects upon climate; for example, that the northern and southern hemispheres are not climatically symmetrical and that the interiors of continents have a greater variation of heat and cold than oceanic regions (Bowler 1992: 208 sqq.).

With the isotherm, variations in territorial shape and location were linked with climatic variation. Other modes of representation, such as maps of the distribution of species, could be related to climatic variation and made to illustrate other regional and global patterns of the environment. To take an example, one map with accompanying tables in Humboldt’s *Essai sur la géographie de plantes* (1807) contains – in Nicholson’s translation of Humboldt’s words – information about

the vegetation; the fauna; the geological connexions; the agricultural cultivations; the temperature of the air; the limits of perpetual snow; the chemical constitution of the atmosphere ... the horizontal refraction of sunlight, and the temperature of boiling water at different altitudes (Nicolson 1990: 181).

Humboldt shared with other Romantics a holistic vision of nature, but he differed from them in his dedicated empirical and quantifying studies. His efforts to represent nature as a system of quantified interrelationships were an important contribution to the modern conceptualization of nature.

The weather forecast as we know it today is one outcome of this transformation of time and space, of quantification, measurement and representation. Traditional forecasts never went beyond weather rules (such as 'a red sky in the morning is the sailor's warning').¹⁷ The predictive power of modern meteorology is based on the knowledge of physical laws of causation and probability, and on the quantification and modelling of nature.

A century ago T.H. Huxley argued that a 'new Nature begotten by science upon fact has pressed itself daily and hourly upon our attention, and has worked miracles that have modified the whole fashion of our lives' (1893: 51-2).¹⁸ Huxley's new Nature is, in fact, the nature of modernity. Modern environmental knowledge has its exemplary expression in ecology, which appeared as a recognizable science during the 1890s (McIntosh 1985: 27). Studying the way living things interact with one another and with their environment, ecology observes, interprets and represents thoroughly quantified natural phenomena. We emphasize, however, that modern environmental knowledge is not necessarily associated with Western ideas of mastery of nature, as Merchant appears to claim: 'for the past three hundred years, western mechanistic science and capitalism have viewed the earth as dead and inert, manipulable from outside, and exploitable for profits' (1992: 41-2; see also 1980). For this knowledge also plays an important role in the environmental ethics of the green movement, whose arguments for moral responsibility towards the environment are based on informed predictions about natural processes which imply quantitative knowledge (Yearley 1992).

Obviously, the environment is more than quantified interrelationships. It is, and has probably always been, a significant source of aesthetic experience and complex imaginations. But what is new about modern environmental knowledge is its predominantly quantitative character which sets it apart from traditional knowledge and constitutes nature in an ecological space. This is the contrast between traditional and modern environmental knowledge that Glacken emphasized in his monumental survey of Western ideas of nature. He found that they formed a 'coherent body of thought' in the 'time span from classical antiquity roughly to the end of the eighteenth century', with the eighteenth century representing 'a closing, once and for all, of a period in the history of Western civilization' (1990: xii-xiii, 713).

Traditional Tibetan ideas of the weather

We shall now turn to pre-modern Tibet¹⁹ and give an account of the ways in which Tibetans understood and related to the weather. We specifically choose to focus on the weather as it was (and still is) an aspect of the environment fundamentally important to daily life in Tibet. It is a well-worn cliché that pre-modern Tibet was a land filled with monasteries populated by tremendous numbers of lamas, monks and nuns. In actuality, the vast majority of pre-modern Tibetans lived either as peasant farmers and labourers, settled or nomadic pastoralists, long-distance traders, hunters, natural produce harvesters, and so on, or combined these modes of production into complex, seasonally dynamic local economies. They were, like most pre-modern peoples, constantly and directly engaged with the natural environment, and the vicissi-

tudes of the Tibetan climate influenced their life patterns and strategies, as well as their fortunes, to a high degree. The importance the Tibetans themselves placed on the influences of the weather was embodied in a number of social institutions and practices, and these in turn were based upon a particular system of knowledge and set of beliefs about nature.

As for the actual climatic conditions in Tibet, although there are significant variations between the wetter, warmer valleys of the far southeast and the bleak mountain deserts of the far northwest, in many areas the Tibetan plateau is one of the world's most extreme permanently inhabited environments. From the point of view of modern knowledge this is mainly related to the region's high altitude, which produces a combination of intense ultraviolet radiation, large diurnal temperature variations and relatively low levels of atmospheric moisture and precipitation (much of which comes in the form of snow, sleet and hail). The climate is also subject to rapid and occasionally violent changes at most times throughout the year, with sudden hail or snow falls and wind (and dust) storms being common occurrences in many areas.

How did pre-modern Tibetans perceive these weather conditions? To approach this question it is well to frame it first with some general comments about the Tibetan world view, the ritual systems to which it was related and the associated attitudes towards 'nature' (that is, 'wild' and 'uncultivated' parts of the environment). Some accounts of Tibet tend to compartmentalize its religious life into discrete categories such as Tibetan Buddhism, the Bon religion and the so-called 'folk religion'. This tends to over-simplify a historical development characterized by a high degree of syncretism and processes of mutual assimilation and influence. Tibetan attitudes to the natural environment have been shaped by ancient (although not necessarily 'indigenous') beliefs and by ideas introduced later, particularly from India and China, and mainly by way of Buddhism. The common feature in all these influences is that the phenomenal world is held to be inhabited by a host of spirit powers and deities who are organized into a single 'ritual cosmos' (Samuel 1993: 157) and must be ritually acknowledged in relation to most areas of human activity. The variation between, for instance, the textualized Tibetan Buddhist approach and that found in the traditional local cults is mainly a difference of ritual strategies and orientations as well as officiants. The former approach (as one would expect of a universal religion) tends to emphasize soteriological concerns – *karma*, cyclic existence (*samsāra*) and its termination in *nirvāṇa* – while the latter is more interested in mundane and pragmatic issues (fertility, fecundity, health, longevity and success). Yet there is no clear distinction between these tendencies for Tibetans in practice. Thus, in relation to dealing with nature, the Buddhist or systematized Bon approach often supplies many of the 'technologies of power' (as Foucault might have said) as well as the specialists to mediate the relationship between humans and the forces believed to animate and govern the phenomenal world.

One important, yet subtle and implicit, characteristic which does distinguish these 'local' and 'universal' ritual orientations of pre-modern Tibetan society towards nature could be described as a 'moral' one. Basically, Buddhism and Bon regard all the 'gods of the world' who inhabit and influence nature as morally inferior because they, like humans, are also subject to the impersonal

moral law of *karma* which binds beings in unsatisfactory cyclic existence. They are therefore seen as being subject to the higher powers represented by the doctrines, deities, rituals and practitioners identified with successful salvation or liberation from the bonds of cyclic existence. Tibetan lamas claim to have access through meditation techniques to an alternative level of reality which is in effect the state of enlightened being, and to the Buddhas and divinities who represent this. By way of this connexion to the higher ontological and moral levels of the ritual cosmos they are considered able in various respects to manipulate the operations of the inferior phenomenal world and its 'lesser gods'.

On the other hand, we find that the 'local' perspective is primarily concerned with respect for the gods of the world. It is conceived of morally in terms of binding relationships between localized human communities and non-human occupants of the same localities and entails mutual obligations. From the human point of view, maintaining this relationship by means of correct, regular offerings ensures a stable environment which yields its bounty. Transgressions, whether inadvertent or intentional, of a wide range of limits prescribed by tradition can upset the sensitive and often capricious local deities of nature who might cause, for example, environmental irregularities, illness and lowered fertility. Tibetans often explain the results of such transgressions (particularly those relating to social interaction) in terms of the production of an embodied and contagious 'contamination' or 'pollution' (*grib*, literally 'shadow' or 'stain') which offends and angers the deities. The local deities must be carefully appeased, manipulated or otherwise coerced, and any contamination thought to exist must be cleansed to restore an equitable balance between humans and the environment they live in and use. It is often at such points that the lamas – the ritual specialists identified with the moral 'high ground' of doctrinal religion and its powers – might be called to intervene. Thus, although drawing upon a more universal cosmology, Tibetan concerns about nature were predominantly focused, especially at critical moments, upon the well-known 'country gods' (*yul-lha*), 'local deities' (*gzhi-bdag*), 'lords of the soil' (*sa-bdag*), 'subterranean serpents' (*klu*), and others, believed to inhabit mountains, passes, cliffs, rivers and lakes within the vicinity of the village community, nomad camp, hunting ground or travel route.

Tibetan conceptions of the weather

Until quite recently traditional Tibetans maintained a sophisticated system of beliefs and practices related to the weather. This system was very different from modern meteorological knowledge. Traditional Tibetans observed the weather and its patterns with a practical eye in much the same way as modern observers do, but they drew very different conclusions about what they were seeing. Tibetans acknowledged all aspects of the weather – rain, hail, snow, clouds, fog, wind, lightning, the sky as a whole – as being under the control of, or as manifestations of, many different classes of gods and goddesses, some more benevolent, others more malevolent. Ritual specialists experienced in the weather observed local conditions and, by 'reading' the shape and movement of clouds, the directions from which wind or thunder might come, the spreading of fog or the sunset colours in the clouds, they could determine which of these

spirit powers might be active at any one time. As the behaviour and characteristics of the spirits were known and predictable, some modest forecasting might be attempted on this basis, and the symbolism of dreams also served as a means of predicting weather (see Nebesky-Wojkowitz 1956: 240-4; 1975). It was not only priests or lamas who regarded the weather in this way. For example, when thunder was heard any ordinary person was just as likely to remark upon the activities and mood of a 'thunder dragon' (*'brug*) who was roaring in the sky above.²⁰ Highly educated Tibetans might theorize such phenomena more fully, and in a song describing the onset of monsoon storms in the southern Tibetan mountains during the summer of 1812 we find a famous lama singing: 'In the midst of the clouds gathered in the azure sky, the first turquoise thunder-dragon of summer roars his song: It is a sign that the elements of cold and heat are equal' (Ricard *et al.* 1994: 251).

The same lama also used meditative techniques against thunder-dragons, and thus was able, he claimed, to drive off summer storms (Ricard *et al.* 1994: 112). Because the weather was equated with spirit powers, it was also seen as susceptible to human influence, and a very wide range of weather-making or weather-controlling rituals existed in Tibetan traditions for purposes such as rain-making, hail protection, frost prevention and snow control.²¹ Without going into details, we should note that there was a widespread tradition of principles for dealing with the weather, but the salient feature of all Tibetan weather-making techniques was that they only operated locally. They depended upon direct observation of local conditions, and the deployment of ritual devices and gestures, strictly on a line-of-sight (or sound) basis in order to address local deities.

The Tibetan weather-makers themselves are interesting as an example of the institutionalization of the pre-modern system of weather knowledge in Tibetan society.²² Hail protection appears to have been the most sought-after service the weather-makers performed. They had a variable status in traditional Tibet, in part due to their perceived ritual abilities as well as their reputation for results. Although some lived as itinerant priests, others, such as the so-called 'hail-protectors' (*ser-'gag-pa*), were lamas (both Bon and Buddhist from all sects) with regular clients in the form of local agricultural communities. Such communities often collected and paid them a seasonal fee (*ser-kehral*, 'hail-tax') for their rituals as a kind of 'insurance' against hail damage to crops. A small number had permanent employment with the Lhasa-based state to influence the weather over the capital, particularly during the staging of pageants and religious ceremonies and above the precincts of important sites, such as the Dalai Lama's residences. Some weather-making lamas were of wide renown, and might be invited to distant places for their services; the hail-protectors of Khams in east Tibet, for instance, were called to Sikkim to perform (Nebesky-Wojkowitz 1947: 62). Other social institutions, particularly legislation (see French 1995: 197-203), were explicitly related to concerns about the weather:

[T]hree routes into the Kingdom of Lo are closed for much of the year. The passes in question – two bordering on Tibet and one on Dolpo – are high, and the reason given for their closure is that travellers may disturb the cloud formations that bring the precious rain. Offenders are subject to paying fines of Rs. 10,000. The custom of territorial closure is replicated in a number of individual villages within Lo [...] The ostensible reason for the closure is invariably the risk of jeopardising rainfall (Ramble 1995: 87-8).

Weather and moral climate

As already indicated, perhaps the most salient feature of pre-modern Tibetan understandings of the weather is the perceived relationship between the vicissitudes of the physical climate and those of the prevailing 'moral climate' created by human activities. This relationship was, like the performance of weather rituals, understood in terms of locality, that is, of specific human communities, their territories and the deities associated with them. Various human actions were believed to affect the local weather. Although disturbing or offensive actions might be defined differently from place to place according to local traditions and particular deities, those most commonly recognized were uprooting wild plants in the mountains, digging stones and soil, polluting water supplies (especially springs), making loud noises by discharging firearms or calling out (especially on mountain passes), leaving corpses uncovered under the sky during the cropping season, and hunting too close to the residence of a local deity. Localized falls of rain and hail, and less often drought, were believed the most common weather change produced by such actions.

In contrast to these minor acts often related to domestic production, other sorts of actions and circumstances with moral implications were believed to determine the weather over large areas and for long periods. These fall roughly into two categories: 'sinful' behaviours as classified by Tibetan religious orthodoxy; and innovations and foreign influences morally unacceptable to the conservative local gods (or their human worshippers). Even simple harvesting practices, such as those mentioned above, could have potential moral and meteorological consequences because of the religious codes. For instance, earlier this century Duncan reported of the Batang area of eastern Tibet:

Forbidden by the religious laws, fishing is rare and is usually done only by outsiders ... The sin of catching fish may affect a large area, the angry spirits of the locality sending storms of rain, hail or snow. Traders who must cross high passes or ford deep rivers are especially careful not to fish or permit fishing by members of their party (1964: 68).

More specifically, the dynamics of the social world were viewed as having a considerable effect upon the weather.²³ Thus, we find that social discord and large numbers of illegitimate births may cause hail to fall in a region (Bell 1928: 43-4). This relates to the belief that embodied moral contamination (*grib*) results from such events and that its presence affects the local deities and thus the weather (Diemberger 1994: 148). There is a long-standing belief that foreign persons and the products of their 'other' worlds are likewise contaminating. The rains that flooded the Lhasa city area in 1725 were blamed on the presence there of the first Capuchin missionaries and the mission which they built (Bell 1928: 145). The severe drought of 1921 in Central Tibet was seen as a result 'of miscellaneous kinds of people coming to Lhasa', referring here to the presence of regular British political and trade missions and other colonial explorers visiting the city (Bell 1924: 203; 1946: 310-12). Nor were such beliefs limited to the city and its agrarian environs. A German ethnographer who studied nomadic populations in north-east Tibet during the 1930s found that his informants attributed abnormally heavy rainfall to his regular research visits there (Stubel 1958: 40). Clearly, these are often *post facto* explanations of meteorological conditions, yet they are all grounded in the belief system outlined so far. Such explanations could also be deployed strategically as a defence against

perceived threats to the social order. An amusing example comes to us from one of the few foreigners (a British radio operator) resident in Tibet during the 1950s, who reported the link posited between the weather and the game of football in Lhasa:

Other Britons had brought the game to Lhasa long before, and it had become so popular that at one time there was an organized league. But the Church had disapproved – it was said the monks wasted their time watching when they could have been praying – and when a hailstorm occurred during a match the game was doomed. Hailstorms in Tibet can be very powerful and cause immense damage to crops, and farmers used to employ special magicians to ward them off. Football could not be allowed to nullify magic that was vital to the country's economy, so in Lhasa the game was now forbidden (Ford 1957: 10; see also Walker 1977: 44–5).

Weather conditions were systematically linked to social life and correlated with a code for proper conduct. Nature and society were conceived to interact, thereby creating a 'moral climate' or, as we might say, a moral space.²⁴

Meeting with modernity

The appearance of football in Lhasa illustrates the slow percolation of selected aspects of modernity into the Tibetan plateau during the twentieth century and the type of reaction these often provoked.²⁵ Although Western visitors frequently carried scientific instruments with them to collect information about the Tibetan environment,²⁶ such activities and the modern knowledge system of nature they related to made virtually no impact upon the Tibetan population and its locally oriented world view.²⁷ The thermometer, a modern invention we have already discussed as being vital for creating a new type of abstract and universally valid global knowledge about the weather, remained unknown in traditional Tibet as a meteorological instrument, except among a very small circle of the educated aristocratic elite who had regular contact with foreigners or who moved outside the country (mainly in colonial India). The thermometer actually provides an interesting case for examining the process by which objects and associated concepts generated by one knowledge system are translated into the terms of another system.

There are few sources with which thoroughly to investigate the reception of any particular feature of modernity in pre-modern Tibet. The development of new vocabulary and language usages is one common but often unacknowledged factor attendant upon the confrontation with modernity.²⁸ It is therefore revealing to turn to the bilingual lexicons produced during the period of Tibet's increasing contact with the modern world. Such sources indicate not only terms in circulation at the time they were compiled, but also joint attempts by the compilers and their informants to use the language of their day to translate new concepts and coin new terms. Let us briefly consider how the English word 'thermometer' and the modern concept of instrumental temperature measurement have been dealt with in over a century of Tibetan-English dictionaries. As an indication that terms for 'thermometer' did not exist in the Tibetan language before extensive colonial contacts, the traditional Tibetan-Tibetan dictionaries do not list the terms found later. We are therefore dealing entirely with neologisms constructed to capture a new concept.

The eight Tibetan-English dictionaries compiled between 1881 and 1988 we consulted (without exhausting the total number produced) yielded ten different descriptive terms coined to express the word 'thermometer' in Tibetan.²⁹ Together they reveal the long search for concise translations in a language which, although sophisticated and flexible, traditionally assumed a different, more locally focused knowledge of the phenomenal world. Nearly all the compound terms constructed to convey 'thermometer' contain an earlier word for 'temperature', *tsha-grang* (lit. 'hot-cold'). *Tsha-grang* is a typical Tibetan compounding of opposites to yield a different and more general order of concept. A common earlier expression for 'temperature' is *grang-dro* (lit. 'cold and warmth') yet it is not used in the new compounds. Few incorporate *dro/drod* ('heat' or 'warmth') except in a variation of the compounded opposition *tsha-grang*, as *dro-grang*, and to denote the medical use of thermometers to record 'body warmth' (*lus-drod*). Compared to the more abstract notion of heat expressed by *tsha*, the concept of *dro/drod/dros* is interesting as it traditionally signified noon. It is found in compounds relating to the midday meal, divisions of time during the day and effects of the sun's heat on the local environment (such as its thawing the frozen soil) in the colloquial language and dialects. These are all locally referent usages, and it is significant that the element *dro/drod/dros* has not been favoured for use in relation to the concept of general temperature measurement in modern Tibetan. In almost all cases the more abstract notion of *tsha-grang*, an expression of relative hot and cold, is used as it is easily severed from local referents and so is more suited to abstract and universal systems of measurement.

One of the pioneering native Tibetan-speaking lexicographers and translators, Kazi Dawasamdub, who worked early in this century, used *drod gsher brtag thabs* (lit. 'means [of] examining warmth and moisture') for 'thermometer' and coined some closely related terms for 'barometer': *tsha grang brtags pa'i lag cha zhig* (lit. 'a tool which examines hot and cold') and *tsha grang brtag byed kyi 'khor lo zhig* (lit. 'a meter [i.e. with clock-face, 'khor lo] which examines hot and cold'). Both these instances show that Dawasamdub or his informants misunderstood the thermometer as a device partly related to humidity measurement, and the barometer as a device related primarily to temperature rather than air pressure, or had not yet sufficiently differentiated between the functions of various types of modern meteorological instruments. Such misinterpretations on the part of well-educated Tibetan persons are unthinkable nowadays as all Tibetans live within the context of global modernity. However, the development of a new language is far from settled or standardized, partly because Tibetan exposure to modernity is still comparatively recent and also because translation and lexicographical efforts are spread over three different (and at times competing) working contexts: Tibetans and Chinese within the Chinese state, the Tibetan community in exile, and Tibetans interacting with Westerners in exile communities and Western countries.

Many other recent changes in the Tibetan language also reflect the shift from the language, concepts and practices of a pre-modern society to more abstract concerns related to modernity and its construction of the world. To give one final example, the traditional word for 'weather' itself was *gnam* ('sky'), referring simply to the view 'above' any particular local observer. In some dialects the

word *gnam-lha* (lit. 'sky-god') (Michiyo & Tsering 1978: 46) was used, referring to the traditional beliefs about the weather we have outlined above. Simple compounds denoted changes in the visible sky, with *gnam-thang* ('clear sky'), for instance, meaning 'fine weather'. Seasonal change was registered with expressions such as *char-dus* ('time of rain') for the monsoon. All such terms were related to local conditions. In contrast, modern Tibetan now only uses the new term *gnam-gshis* (lit. 'sky-character/disposition') expressing an abstract and delocalized system of observation and description of climate, along with other new descriptive terms for weather conditions, forecasting, scientific measurement of the weather, and so on.

Linguistic change is, perhaps needless to say, uneven, with traditional language usages surviving in many rural areas among older persons and dialect speakers, while new ones are most common among mobile, educated younger people. The same comments apply to knowledge about, and acceptance of, the general world view of modernity. Contemporary Tibetan nomadic yak herders on the high plateaux might now gather around the transistor radios in their tents and listen to modern regional weather forecasts broadcast on shortwave. However, at the same time many also continue to respect the local gods whom they still believe influence their local weather.

Conclusion

By focusing on ideas about the weather, we have compared modern environmental knowledge with traditional Tibetan knowledge. Modern knowledge represents the environment as an ensemble of global, quantified interrelationships, whereas traditional Tibetan knowledge represents it as a system of local, qualitative interrelationships of humans and spirit powers. There is a fundamental difference between the two knowledge systems in the way the environment is constituted. Modern knowledge constitutes it as an ecological space, whereas in traditional Tibetan knowledge it is a moral space.

In pre-modern Tibet the weather was closely linked to social life in the sense that the relationship between humans and the natural environment was mediated by processes of moral interpretation. Deities produced the weather and responded to disturbing or unacceptable human behaviour by sending bad weather. The priests and lamas who were human weather-makers attempted to control the weather by calling upon forces which were considered morally superior within the traditional ritual cosmos. Thus, the social and moral order encompassed and extended into the natural environment, turning it into a moral space of qualitative interconnectedness.³⁰

Modern environmental knowledge is predominantly quantitative and is framed by abstract co-ordinates of time, space and other universally defined systems of measurement and representation. It implies familiarity with physical laws of causation and probability without which it is impossible to objectify nature in ecological terms. So, when modern Tibetans praise their ancestors for their ecological awareness, they are, in fact, inventing them in their own image, and are speaking from a historical position where ideas of the environment are heavily influenced by ecological and environmentalist knowledge.³¹

This article is not written simply to argue against recent Tibetan claims to ancient ecological wisdom or to show that the weather or, more generally, 'nature', is a cultural construction. That would hardly be necessary considering the large and long-standing anthropological literature recommending a relativist perspective on the concept of nature. One should not expect to find traditional Tibetan ideas of the environment modelled on the modern, or Western, nature-culture dichotomy. Recently, however, Ingold (1996: 117) has pointed out that it is much easier to say that nature is a cultural construction than to ascertain what this should mean.³² By indicating how the fundamental features of modern environmental knowledge have emerged in Tibet as a framework for the interpretation of natural phenomena, we hope to have offered one illuminating example of the cultural construction of nature.

NOTES

This article is based on printed sources but is also informed by our field experience in various Tibetan areas in Tibet proper, Nepal, Bhutan and Ladakh. We are grateful to colleagues for their comments and to Simon Harrison and the anonymous readers of the *JRAI* for their constructive criticisms.

¹ See, for example, Dwivedi (1990); Izzi Deen (1990); Momaday (1976); Swain (1991). A number of scholarly works endorse such viewpoints: for example, Callicott & Ames (1989); Hughes (1983); Vecsey & Venables (1980). For a critical interpretation which emphasizes the identity politics behind such claims, see Pedersen (1995).

² For a range of such statements in both English and Tibetan, see the relevant passages in Anon. (1994: 7), Atisha (1991), bsTan-'dzin Phun-tshogs A-ti-sha (1994); Department of Information and International Relations (1992: section 1.9); Geshe Damdul Namgyal (1994: 29); Räther (1994); Rowell (1990: 11); Vigoda (1989); Yeshi (1991) and Yuthok (1992).

³ That is, as representational tools in a propaganda war against the colonial Chinese state. This involves portraying a 'Shangri-La' image of Tibet to the West in an attempt to gain support and political backing. See Huber (in press *a*; in press *b*).

⁴ Note that by invoking three millennia of 'tradition', this statement is in conflict with many others which stress the primary role of Buddhism in Tibetan ecological thought and practice, because Buddhism has only existed in Tibet in a widespread, institutionalized form for less than a millennium.

⁵ See also fig. 16 and caption in Adams (1996: 162) for a link between these types of statements and those made by Westerners but deployed by contemporary Tibetan Buddhists.

⁶ This was also the case where calendars were known. In ancient China there were 'two separate official calendars, one for the peasant, which followed the seasons, and one for the scribe, which was a pure number-system' (Leach 1954: 121).

⁷ Thrift (1990) provides an interesting Western parallel to the localized time-reckoning of the Tiv. Until the mid-nineteenth century most English towns had their own time zones, which created many problems for the railway companies and their passengers in designing and understanding timetables.

⁸ Printing played here, as in so many other areas, an important role. See Eisenstein (1983).

⁹ Hallpike (1979) offers a discussion of ideas of time and space which is clearly relevant to our argument here (see especially his chapters 3, 6, 7 and 8). We do not, however, share his particular interest in cognitive evolution.

¹⁰ Westfall has pointed to four aspects of the concept of nature which followed the scientific revolution of the seventeenth century. He writes that 'nature was quantified; it was mechanized; it was conceived to be other; it was secularized' (1992: 65). Here we shall only be concerned with quantification, though the three other aspects are, of course, closely related to it. We are well aware that the quantification of nature was a slow process and that measurement and quantification did not take their fundamental role in the sciences until the 1830s and 1840s: see Hacking (1983: 233 sqq.); Kuhn (1977).

¹¹ Or, in Alexandre Koyre's words, 'It is not so much the thermometer which is lacking, but rather the idea that heat is susceptible of exact measurement' (cited in Cohen 1994: 87).

¹² By 'global knowledge' we are not thinking of something being known by everybody throughout the world. Instead, we refer to a kind of knowledge which is valid everywhere, i.e. knowledge independent of context.

¹³ Probably by Santorio. Frisinger gives the credit to Galileo and bases his claim on Middleton (1966) but appears to have misunderstood him. See Middleton (1966: 14).

¹⁴ One should not, however, ignore the fact that traditional knowledge about the weather still exists. Many people probably rely on traditional weather rules to some extent, but the authoritative voice concerning the weather is the meteorologist's. For an informative account of the 'culture' of television weather programmes, see Ross 1991. We are grateful to Peter Hansen for this reference.

¹⁵ This change in scientific orientation was, of course, part of the picture Foucault (1970) has painted of the thoroughgoing transformation of the unconscious metastructures of Western European thought.

¹⁶ This is equally true of his interest in weather and climate. 'Die grosse Aufgabe, die sich Humboldt gestellt hatte, bestand in der Zusammenfassung aller meteorologischen Beobachtungen zum *realen* Klima' (Schneider-Carius 1955: 151; our emphasis).

¹⁷ For examples of classical Greek and ancient Indian weather forecasting, see Theophrastus (1949) and Ramanathan (1993).

¹⁸ Compare John Dryden writing in 1668:

Is it not evident, in these last hundred years (when the Study of Philosophy has been the business of all the *Virtuosi* in *Christendome*) that almost a new Nature has been reveal'd to us? that more errors of the School have been detected, more useful Experiments in Philosophy have been made, more Noble Secrets in Opticks, Medicine, Anatomy, Astronomy, discover'd, than in all those credulous and dotting Ages from *Aristotle* to us? so true it is that nothing spreads more fast than Science, when rightly and generally cultivated (cited in Cohen 1994: 1).

Dryden saw what was coming, Huxley that it had come.

¹⁹ By 'pre-modern' here we mean pre-1959, a date which not only marks the full Chinese colonial occupation of Tibet but also the beginning of a period of intensive structural changes, such as social and land reforms, modernization and, later, infrastructure developments. While the extent and effects of changes introduced by the Chinese state remains unevenly spread over the area of the Tibetan plateau, by way of these changes no population of Tibetan people is today remote from the powerful influences of the global economy, high technology communications systems and transnational social and political agendas (development, environmentalism, political reform and so on). By 'Tibet' here we mean 'ethnographic Tibet', as described by Goldstein (1994: 76-7), Richardson (1984: ch. 1) and Samuel (1993: chs. 1-8). This is an area comprising the Tibetan plateau, its eastern marches and various high altitude Himalayan valley systems inhabited by peoples of similar language, cultural and social patterns and historical experience; it is not coterminous with any historical or modern political boundaries.

²⁰ For example, Ekvall (1964: 70-1); Sherring (1906: 336). The Tibetan expressions for thunder, '*brug-sgra*' or '*brug-skad*', literally mean 'noise/speech of the dragon'.

²¹ See the excellent study of such rituals by Klaus (1985); also Nebesky-Wojkowitz (1975: ch. 24).

²² On traditional Tibetan weather-making and weather-makers see Bell (1928: 43-4; 1946: 266); Carrasco (1959: 20, 49); Cassinelli & Ekvall (1969: 264-5); Dargyay (1982: 28); Das (1970: 24); Duncan (1964: 23); Kawaguchi (1909: 275-6); Lockhart (1988: 194-5); Macdonald (1929: 240-1); Nebesky-Wojkowitz (1947: 62-4; 1956: 240-4); Norbu (1974: 30); Sherring (1906: 336) and Walker (1977: 45). Tibetan weather-makers are still used by the Tibetan Government-in-Exile stationed in India (Woolf & Blanc 1994). As Huber personally observed during the 1993 winter drought in New Zealand, which lowered the mountain lakes used for hydro-electric power generation and led to nationwide electricity cuts, a Tibetan lama resident in a Buddhist mission visited the lakes and performed rituals intended to bring about rainfall.

²³ See Sandell (1995: 157-8) for a parallel example showing the link made between weather and negative social behaviour by contemporary Sri Lankan Buddhist farmers.

²⁴ Modern 'greens' might also think of the relationship between humans and the environment as constituting a 'moral space' in the sense that people as part of nature have a moral responsibility towards it. This is, however, different from pre-modern Tibetan moral space, because the former implies quantified environmental knowledge, whereas the latter does not, see Yearley (1992).

²⁵ Aris (1982: 118-20) describes the negative reactions of powerful Buddhist clerics to the display of Samuel Turner's scientific instruments at the Bhutanese court in the late eighteenth century. For other examples of negative reactions in Tibet, see Dhondup (1984: 56) on resistance to modern mining techniques and motorcycles, Spence (1991: 46-8) on hostility to modernization in general and products imported from India, and Tsarong (1990: 17) on objections to motor vehicles and modern goods.

²⁶ For example, the Schlagintweit brothers' Tibet expedition of the 1850s (Lindgren 1972), sponsored by the Prussian King Friedrich Wilhelm IV, made detailed scientific observations, including meteorological ones, using the most up-to-date and expensive instruments available (Seeberger 1982), in research directed by Alexander von Humboldt himself. Even Victorian adventure-travellers and 'sportsmen' (i.e. big game hunters) took up the modern passion for scientific weather measurement. For example, Thorold and Bower, who traversed the high plateau north of Lhasa in 1891, recorded daily minimum temperatures together with data on altitude over a six-month period (Bower 1976: 302-4).

²⁷ A case in point is modern cartography. Stoddard (1988: 469) ventures that the rebel intellectual Gendün Chömpel was probably the first Tibetan to produce a modern map of the globe in 1937 after living in India, and he was involved in hot debate with other leading Tibetan intellectuals of his day who argued for the traditional view that the world was flat. Ford (1957: 61) notes that even in the 1950s the highest-ranking officials and military commanders of the Lhasa government relied on local oral maps and simple traditional drawn maps (Aziz 1975; 1978; Huber 1992), and hence were desperate to obtain modern cartographic maps for planning an effective defence against the invading Chinese army who were equipped with such advantages.

²⁸ Very little study has been made of this topic in regard to Tibet, but see the interesting work by Shakya (1994).

²⁹ See Jäschke (1881): no entries for 'thermometer'; Bell (1905): *tsha grang lta ya* ('to see hot and cold'); Lama Kazi Dawasmdup (1919): *tsha grang gzhal byed keyi lag cha* ('tool which measures hot and cold') and *drod gsher brtag thabs* ('means [for] examining warmth and moisture'); Goldstein (1983): *tsha grang lta chas* ('thing [for] seeing hot and cold'), *tsha grang brtag dpyad yo chas* ('instrument [for] examining hot and cold'), *lus drod dpyod chas* ('instrument [for] examining body heat'-medical), *dro grang lta chas* ('thing [for] seeing hot and cold') and *dro grang dpyad chas* ('thing [for] examining hot and cold'); Chopel (1985): *tsha grang lta chas*; Goldstein & Narkyid (1985): *tsha grang brtag tshad* ('measurement [of] hot and cold'); Dhongthong (1988): *tsha grang lta chas* and *lus drod dpyod chas*; bKra-shis Tshe-ring (1988): *drod tshad lta chas* ('thing [for] seeing temperature').

³⁰ This is not to say that there was no quantification in pre-modern Tibet. Of course there was. The nomads would count their sheep, and the weather makers would count the villagers who were to pay the hail-tax. But the thorough quantification of the environment we have outlined above was unknown.

³¹ Vitebsky offers a striking parallel to this from north-eastern Siberia. Here present-day, urban Sakha (Yakut) energetically explore their shamanistic past but bring it into a context which differs from the previous 'religious sensibility of the herder's and hunter's movement across a local landscape'. Shamanism is now – in combination with ecological consciousness and other ancient wisdom – invoked as a marker of Sakha ethnic identity (Vitebsky 1995: 190).

³² See also the excellent research presented in works edited by Croll and Parkin (1992b); Ellen and Fukai (1996); and Descola and Pálsson (1996).

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Le savoir météorologique et les idées sur l'environnement dans les sociétés traditionnelles et modernes: le cas du Tibet

Résumé

Le savoir moderne sur l'environnement diffère du savoir traditionnel sur l'environnement par le fait qu'il est absolument quantitatif. Nous donnons un exemple de cette différence en comparant la météorologie moderne et le savoir traditionnel tibétain sur les conditions atmosphériques. La météorologie moderne traite les conditions atmosphériques comme un système de relations globales et quantifiées, tandis que le savoir traditionnel tibétain les relie à un système de relations locales, qualitatives, entre les humains et les pouvoirs spirituels. Sur cette toile de fond nous examinons les récentes déclarations des Tibétains sur leurs intérêts traditionnels en matière d'écologie et de conservation. Nous soutenons que ces déclarations sont des projections anachronistiques d'idées sur l'environnement appartenant à une tradition moderne du savoir inconnue aux Tibétains anciens ou traditionnels – ou à aucune autre société semblable.

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