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The Medicine Tree: Unsettling Palaeoecological Perceptions of Past Environments and Human Activity

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Abstract

In this paper, we consider palaeoecological approaches to past landscapes and reflect upon how these are relevant to archaeological themes concerning concepts of environmental change and the role of past and present human communities in these processes. In particular, we highlight the importance of local context in the perception and understanding of landscape. Utilising a case study from Nepal, we look to 'unsettle' a conventional palaeoecological interpretation of a pollen record, originally constructed on western ecological principles, and instead draw on an interpretative perspective rooted in local Buddhist ecological knowledge, or a 'folk taxonomy', known as 'The Medicine Tree'. We discuss how the interpretations of patterns and processes of vegetation change from a pollen record are not necessarily absolute. In particular, we outline how the palaeoecological frame of enquiry and reference is rooted in an essentially Eurocentric, Western scientific paradigm, which, in turn, shapes how we perceive and conceive of past landscapes and the role of 'anthropogenic impact' on vegetation. The aim of this is not to suggest that scientific approaches to the 'reconstruction' of past landscapes are necessarily invalid, but to illustrate how 'empirical' scientific methods and interpretations in archaeological science are contingent upon specific social and cultural frames of reference. We discuss the broader relevance of this, such as how we interpret past human activity and perception of landscape change, the ways in which we might look to mobilise research in the context of contemporary problems, issues concerning 'degraded landscapes' and how we incorporate local and archaeological perspectives with palaeoecology within an interconnected and iterative process.

Keywords

Palaeoecology, Buddhism, perception, landscape, human impact, traditional ecological knowledge

Introduction

In this paper, we will look to 'unsettle' a conventional palaeoecological interpretation of a pollen record from Nepal, utilising an interpretative perspective rooted in a Buddhist traditional ecological and medicinal knowledge, *Sowa Rigpa*, which can be depicted pictorially, such as in 'The Medicine Tree'. We discuss how the interpretation of patterns and processes of vegetation change from pollen records are not necessarily absolute but reflect the specific palaeoecological frame of enquiry, generally rooted in an essentially Eurocentric, Western scientific paradigm. We do not intend to argue that such approaches to the 'reconstruction' of past landscapes are in any sense 'wrong', but hope to illustrate how apparently 'empirical' (*sensu* Johnson, 2010) interpretations are contingent upon prevailing social and cultural frames of reference. We consider how this inevitably leads to potential discontinuities concerning the integration of two different types of information: the scientific (palaeoecological) and that from locally situated, indigenous perspectives. We will argue that by foregrounding our own interpretative frameworks and recognising that 'past environments' are only ever reifications in and of the present, we can allow for enriched and 'flatter' accounts of the present/past which in turn may provide different approaches to the integration of environmental and cultural records.

In addition, we propose that this has significance beyond purely theoretical exposition and may help mobilise palaeoecological research in the context of a range of contemporary issues concerning current environmental change and conservation policies. Within the context of sustainability, there is a recognition of the importance of providing access to the 'best available knowledge', but also in creating a sense of ownership of the particular problem being addressed (Lang et al., 2012). To fully engage within these debates, we argue that palaeoecology needs to be reflective of its own legacy and practices to better understand its relationship with other forms of knowledge production.

The practice of palaeoecology

Palaeoecology is rooted strongly in the natural science paradigm from which the discipline developed during the early years of the 20th century, and the pioneering work of Von Post in particular (Birks, 2005; Edwards et al., 2017). In terms of the most common palaeoecological method, palynology (the study of sub-fossil pollen), the subject naturally aligns itself with its parent disciplines of botany and ecology. Palynological studies generally focus on relatively long chronological scales (usually of centuries to millennia) with particular attention paid to the roles of climate change and human activity in influencing vegetation change and in the overall development of environments and ecosystems. Subsequent developments have seen palaeoecology expand over the space of less than a century to contribute to diverse areas of enquiry, from climate science to archaeology, with the connection between the latter especially pronounced (Edwards et al., 2015, 2017). Within archaeology the close association of palynology (and palaeoecology as a whole) with other scientific techniques used in archaeology grew out of 'The New Archaeology' of the 1960s (e.g. Johnson, 2010; Smith, 1997), especially in northwest Europe. The integration of the two fields of study continues to break new ground in terms of our understanding of pattern and process of environmental and cultural changes (e.g. Edwards et al., 2015). As well as archaeology, palaeoecology has interfaces with a number of other disciplines, such as ecology and conservation (e.g. Birks, 2012; Blundell and Holden, 2015; Mercuri et al., 2015; Rick et al., 2014; Vegas-Vilarrubia et al., 2011/9), and increasingly within the fields of ecosystem service assessments (Colombaroli and Tinner, 2013; see also Dearing et al., 2012; Gosling and Williams, 2013; e.g. Jeffers et al., 2015) and climate change studies (e.g. Lebamba et al., 2012; Sadori et al., 2016; Seppa and Bennett, 2003).

However, these interfaces mentioned above might all be described as rooted in western, scientific epistemologies. We can also follow Mazzocchi's (2006) suggestion that dialogue should be encouraged between different knowledge structures, including those of indigenous perspectives, or other voices from outside of the traditional, westernised, scientific knowledge structures, such as oral traditions or from other disciplines within the arts and humanities. In doing so, we may link this perspective to recent thought within the humanities, and to an extent within the sciences, of how apparently 'neutral' and 'scientific' interpretation is always rooted in a cultural framework; in particular, a Western perspective imbued with specific ideas of value and definitions of progress (see Braidotti, 2013: 25). Again, this is a subject that has been widely discussed within other disciplines and fields such as sustainable development (e.g. Nilsson and Swartling, 2009), biology (e.g. Carvalho and Frazao-Moreira, 2011; Vandebroek et al., 2011), pharmacology (e.g. Reyes-Garcıa, 2010) and archaeology (e.g. Atalay, 2012; Pikirayi, 2016). In archaeology, Atalay (2012: 76) notes, 'the distance between Indigenous/local knowledge and scientific archaeological knowledge, though challenging to bridge, forms a space for tensions that can be valuable in leading to better archaeological theory'. However, thus far palaeoecology is not, as a rule, given to such theoretical reflection or critique (Richer and Gearey, 2017), but there are examples of this (Jackson 2012); or to combining different knowledge structures.

To develop and illustrate these issues and concepts, we present a case study of a palaeoecological record from Nepal, outlining the original interpretation of a palynological sequence in terms of vegetation change and the associated role of past people. We then discuss the indigenous Buddhist system of *Sowa Rigpa* and 'The Medicine Tree', and consider how interpretation of this palaeoecological record may be very different if approached using this system of traditional ecological knowledge. We will argue that different interpretative frameworks can exist alongside each other, and by exploring a plurality of perspectives we can start to move away from dominant narratives that are often underlain by normative disciplinary assumptions.

Case study: Vegetation history and human impact in Himalayan Nepal

We start by considering a pollen diagram derived from the palynological analysis of a 3.7 m sediment core from Jharkot (Figure 1), which provides a valuable vegetational history for Mustang (Miehe et al., 2009; see Figure 2), located in the Himalayan region of Nepal.

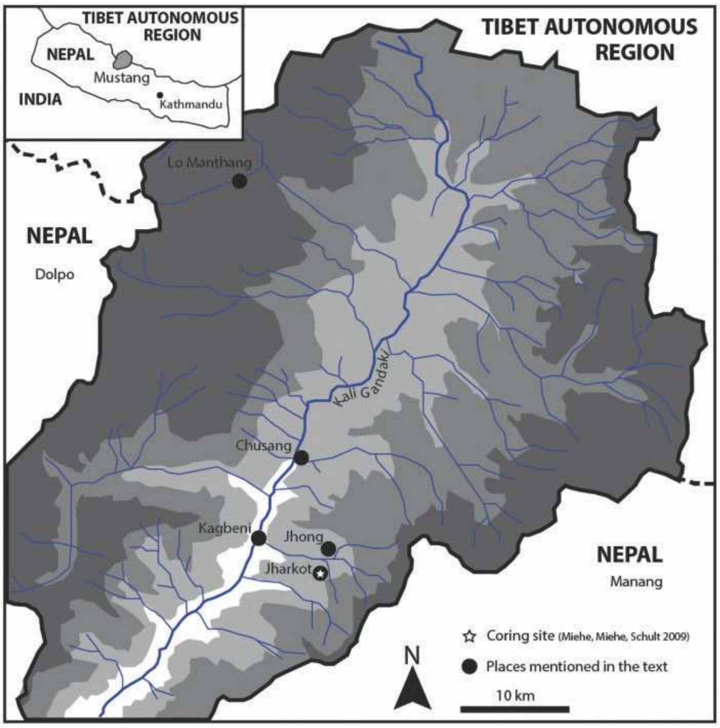

Figure 1. Location map of Mustang District, Nepal and places mentioned in the text

The location of the Miehe et al. (2009) palaeoecological sequence in Jharkot, Mustang, sits within the Annapurna Conservation Area Project (ACAP). Originally set up in the 1980s, and fully recognised in 1996, it is an example of an 'integrated conservation and development project' (Baral et al., 2007) where the aims included the integration of sustainable development, biodiversity conservation, public participation and economic development (Schuett et al., 2016). The interpretations of past vegetation change and the associated identification of human impact at Jharkot are based in part on data obtained from modern floristic records, vegetation monitoring and archaeological data from the region (Miehe et al., 2009). Chronological control was provided by three radiocarbon dates (Hv 22983, Beta-156302 and Beta-154331, see Table 1) from the original publication (Miehe et al., 2009). We have used a Bayesian approach to model the radiocarbon determinations in order to provide an age-depth model for the sequence (Figure 3), in turn, this allows us to estimate the age of events in the original pollen diagram such as the boundaries of the pollen assemblage zones (see Table 2).1

Plants and people: The original interpretation.

The pollen record (Figure 2) opens around *9335–6910 cal BC* (*68% probability; Base*, Table 2) and is interpreted as demonstrating the presence of a forest dominated by *Pinus wallichiana* (pine), with

Table 1. Radiocarbon dates from Jharkot, Mustang, Nepal (after Table 1 in Miehe et al., 2009).

Lab code	Depth	Material	Radiocarbon age (BP)	Calibrated date (95% confidence)	*Posterior density estimate (95% probability)*
Hv 22983	79–82	Bulk sediment	830±140	cal AD 900–1410	*cal AD 880–1400*
Beta-156302	122–131	Bulk sediment	2870±40	1200–920 cal BC	*1195–925 cal BC*

Beta-154331	162–171	Bulk sediment	4620±40	3520–3340 cal BC	*3520–3130 cal BC*

Table 2. Estimated dates for events in the pollen sequence, derived from the age-depth model (Table 1 and Figure 3).

Parameter	*Posterior density estimate (68% probability)*	*Posterior density estimate (95% probability)*
LPAZ_2_3	*cal AD 1050–1465*	*cal AD 920–1835*
LPAZ_1_2	*3500–3350 cal BC*	*3520–3130 cal BC*
Base	*9335–6910 cal BC*	*9335–5085 cal BC*

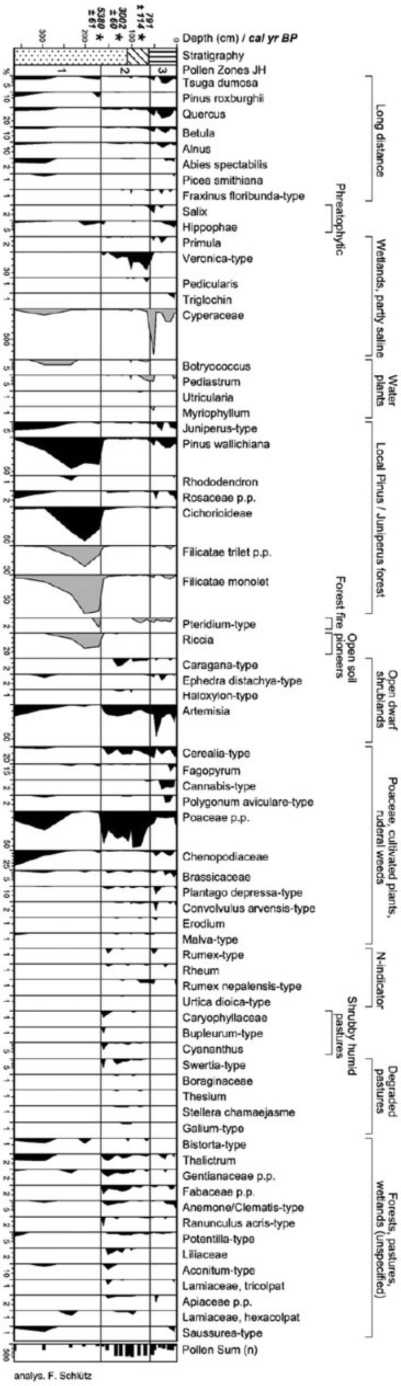

Figure 2. Original pollen diagram from Jharkot, Mustang, Nepal (after Figure 7 in Miehe et al. (2009)).

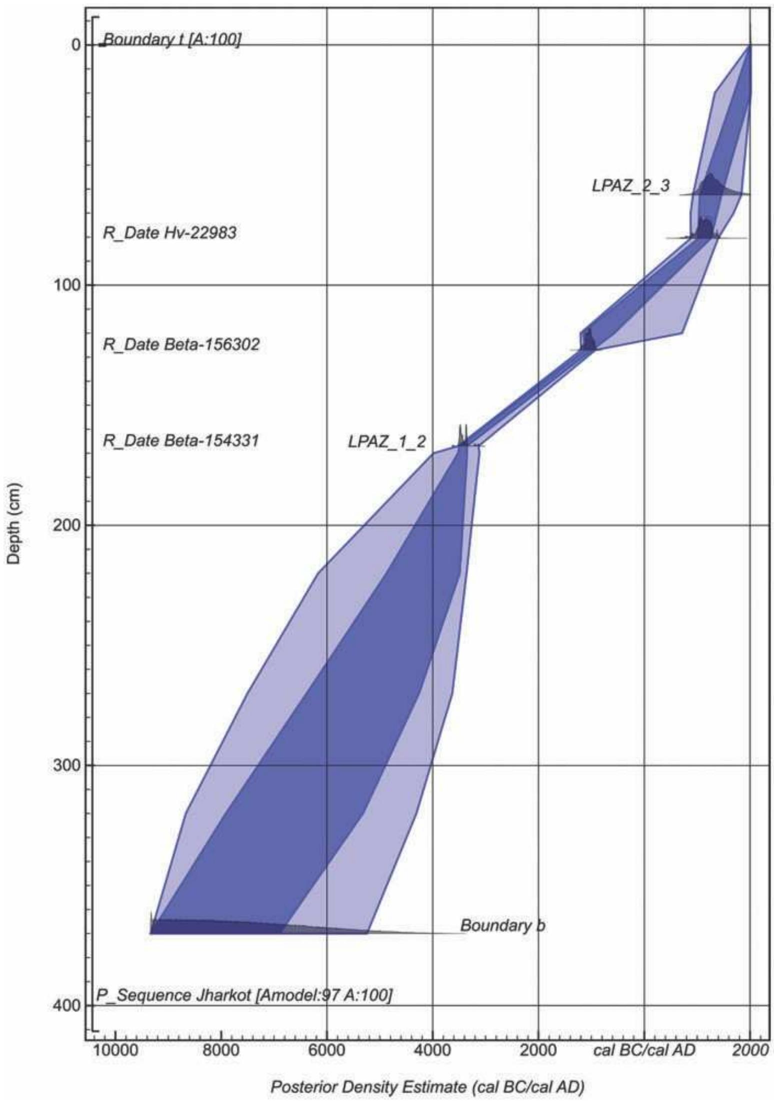

Figure 3. Bayesian age-depth model of the chronology of the sediment sequence at Jharkot, Mustang, Nepal (P_Sequence model (k¼0.01–100); Bronk Ramsey, 2008; Bronk Ramsey and Lee, 2013). The bands show the estimated date of the sediment at the corresponding depth at 95 per cent probability (light) and 68 per cent probability (dark).

Juniperus indica (juniper), *Abies spectabilis* (fir) and *Sorbus* (ash/rowan), and a mixed herbaceous ground flora with abundant ferns, suggesting a 'moderately humid environment'. The loss of this woodland at *3500–3350 cal BC* (*68% probability; LPAZ_1_2*, Table 2) is described as 'incisive and sudden' with the reduction in pine accompanied by indicators of 'disturbance' including *Riccia* (liverworts) and *Hippophae thibetana* (buckthorn), both of which are typical of unstable or exposed soils. It is suggested that as a consequence of the removal of woodland in the mid-fourth millennium BC, mass movements of soil in the form of landslips occurred. The destruction of woodland is attributed to the earliest settlers in the area, who may have burnt the pine woodland and begun cultivation of buckwheat on 'rain fed un-terraced fields' (Miehe et al., 2009).

In zone 2 the vegetation was dominated by open dwarf shrublands with *Artemisia santolinifolia* (wormwood) and *Caragana gerardiana*. Deliberate anthropogenic activity is identified as the cause of the transition from forest to an essentially open, treeless landscape, with pollen taxa associated with ruderal habitats such as 'wastelands' and 'highly degraded common pastures'. However, despite the study area and its surrounds being one of the most archaeologically explored Himalayan areas in Nepal (Aldenderfer and Eng, 2016; Alt et al., 2003; Eng and Aldenderfer, 2017; Knorzer, 2000; Simons et al., 1998), relatively little is known about the prehistory of the area. The earliest radiocarbon-dated archaeological evidence comes from Jhong (see Figure 1), in the form of macroremains of cultivated crops (buckwheat, naked barley and flax) found within burial caves located c. 2 km away from the coring site. The date reported is c. 1000 BC (Knorzer, 2000, further details of the determination are not given) and post-dates the first evidence for human activity seen in the pollen diagram.

The final zone of the pollen diagram records the last *545–950 years* (*68% probability* distribution not shown) of 'human impact'. This impact is inferred from the high levels of *Cannabis*, indicative of cultivation, the exploitation of 'fodder resources' and the possible evidence for the presence and subsequent abandonment of irrigated corn fields. Cultivation within the valley is largely corroborated by the archaeobotanical evidence (Knorzer, 2000).

The interpretation of the Jharkot pollen record therefore presents a narrative of human activity in the area, and the implication that 'human impact' was the main cause of mid–late Holocene vegetation and environmental change in this area of the North Central Himalayas. This interpretation is entirely in keeping with what we may describe as a conventional palaeoecological paradigm, focusing on the identification of 'human impact' through reductions in trees and shrubs and the appearance of 'anthropogenic indicators' (as outlined above, Behre, 1981) which imply the presence of 'ruderal' habitats.

Whilst we do not wish to directly question the interpretation of this pollen diagram originally presented by Miehe et al. (2009), it is clear that the methodological format and approach adopted follows an established 'traditional' ecological framework. The pollen data are plotted on a diagram structured following Linnean taxonomic principles for the naming of plants and ecological groupings (Figure 2). Although there can be discrepancies between the relative level of analytical precision that palaeoecology can achieve, necessitating the use of nomenclature and conventions that may cut across botanical divisions (e.g. Bennett, 1994; Beug, 2004), Linnean taxonomies would probably be regarded by most practitioners in western Europe, at least, as relatively established and uncontroversial 'scientific' structures. However, this taxonomic system has in the past been criticised in a number of ways. Of particular interest here are those critiques dating back half a century (Walters, 1961, 1962, 1986) which described the Linnean codification of Angiosperm classification as a 'European folk taxonomy'; the essential point being that the Linnean system represented 'a de facto dominance of European ideas and European institutions' (Walters, 1986: 543). Other researchers also drew attention to this 'Eurocentric' bias in national scientific frameworks, Seddon (1981–2) even stating that: 'the sciences in Australia have been distorted - and generally retarded by European perspectives'. Raven et al. (1971: 1213) concluded that most folk taxonomic systems are not designed as 'information retrieval systems' but were used to 'communicate about the organisms with others who already know the culturally significant properties of the organisms being discussed'. The structure and utility of 'folk taxonomic' systems subsequently received much attention, with the development of ethnobotany (e.g. Berlin, 1992) and related fields such as ethnobiology. An important aspect of this was the realisation that many 'folk systems' were extremely sophisticated, often matching the scientific taxonomies 'rank by rank, category by category' (Nazarea, 2016: 42). Whilst palaeoecologists have developed other non-Linnean approaches for analysing pollen data (e.g. land cover categorisations/biomisation; e.g. Fyfe et al., 2010; Marchant et al., 2009) these are still essentially based in an ecological, scientific paradigm.

The Medicine Tree.

Rather than only following a Western scientific paradigm to provide the framework for a palaeoecological interpretation of the Mustang pollen diagram, it is thus equally valid to draw on indigenous perspectives and beliefs, such as those depicted in images like the 'The Medicine Tree' (Figure 4). Following this line of thought, we look to *Sowa Rigpa*, considered to be one of the oldest such systems surviving into the present day (Gurmet, 2004). *Sowa Rigpa* shows strong methodological and theoretical links to Ayurvedic practice, the first signs of which are seen in Tibet in the third century AD (Gurmet, 2004). Although oral history takes its practice back far beyond this date (Bista and Bista, 2005). The historical sources for medicinal practice, by their very nature, do not encompass the whole period of the pollen diagram or indeed the prehistoric archaeology of Mustang. However, *Sowa Rigpa* is strongly rooted in the area and provided the only form of medicinal knowledge and practice available in the Buddhist areas of the Himalaya until the 1960s (Gurmet, 2004). Whilst Mustang politically falls into Nepal, it is culturally, historically and geographically associated with Tibet and Tibetan Buddhism.

Written for students of *Sowa Rigpa*, a short guide (Bista and Bista, 2005) exists that documents just over 50 of the medicinal plants used by *Amchis* (practitioners of *Sowa Rigpa*) in Mustang and their traditional medicinal attributes, knowledge that has been handed down from generation to generation. Within a tradition of oral and pictorial knowledge transmission, Bista and Bista (2005) offer a rare glimpse into one particular type of traditional ecological knowledge that is ultimately anything but ecological in the conventional sense, instead being concerned with well-being. The medicinal knowledge system is deeply rooted in the lives of the people who live in the Buddhist Himalaya: even if we cannot extend it unproblematically back into prehistory, it is one (of potentially many) other ways of viewing this landscape in the present. Perhaps most significantly, it is one that is directly relevant to the lifeworlds of the current indigenous populations of the area.

To talk in terms of 'medicine' may imply, to a western/scientific mindset, that the practice is purely about curing illness. Instead, *Sowa Rigpa* is concerned with interconnectedness. In the initial instance, this is the relationship between the mind, body and soul of the person being treated. For the purposes of transmitting this knowledge in what was largely an illiterate society, the image of a tree has traditionally been used: the Medicine Tree (see Figure 4 for an example). Within *Sowa Rigpa*, three poisons are defined: delusion, attachment and aversion. These are not physical poisons as would be understood in western medicine but perhaps spiritual poisons. The fruits of these poisons are the three humours: wind, bile and phlegm. This continues to break down into further categories, but the underlying idea is that the humours need to be kept in balance in order for good health (physical, spiritual and well-being) and this is achieved by using appropriate plant, mineral and animal products, which have particular 'tastes' or 'energies' ascribed to them.

Figure 4. *Thangka* of Tree of Healing and Therapies. Using colours, the *thangka* illustrates ways in which disease (caused by an imbalance of the humours) could be treated with plants, animals and minerals, some of which can be seen here. Yellow branches: butter and dandelion leaves are represented, these are used for bile imbalances. Blue branches: garlic and meat are represented, these are used for treating wind imbalances. Green branches: honey and fish are represented, these are used for treating imbalances of phlegm. The healers depicted can be seen preparing medicines (Williamson, 2009). Image reproduced courtesy of the Division of Anthropology, American Museum of Natural History, catalogue number 70.3/5467.

This interconnectedness also extends into the landscape. Mineral, plant and animal products from the Himalaya make up the medicinal products that are used to bring one's body back into balance again. In this way, the division between people and the environment, nature and culture, starts to dissolve and instead a landscape of connections emerges. Craig and Gerke (2016: 96) refer to *Sowa Rigpa* as an embodied way of dwelling within and perceiving the environment illustrating how 'the conceptual frameworks for understanding health and responding to illness became linked to local, indigenous, and ''enskilled'' practices'. In practical terms each natural ‘product’ is ascribed an attribute of sweet, sour, salty, bitter, hot and astringent, and the administration of the appropriate element would be used to bring one’s body back into balance. For example, if one was suffering from an ailment that is considered ‘cold’ one would need something ‘hot’ to counter it. The following section considers how the utilisation of local knowledge can radically alter the interpretation of this pollen record.

The Medicine Tree interpretation.

Drawing directly on the medicinal plant knowledge from Bista and Bista (2005), and a publication about traditional medicine in the area by Bhatterai et al. (2010), it is possible to reframe the interpretation of the pollen diagram to one that draws on these ‘other’ botanical knowledge systems rather than on a Western scientific/ecological framework (Table 3). A selected reinterpretation of the pollen diagram has been undertaken below by examining the qualities ascribed to the plants by Bista and Bista (2005) and using these to interpret the palynological data. Fifty-one plants were described by Bista and Bista (2005) in terms of their elemental type, potency and description; of these, 20 are represented in the pollen diagram

Table 3. Summary of the original ecological interpretation (Miehe et al., 2009) and a *Sowa Rigpa*-based interpretation of the pollen diagram.

Pollen zone	Ecological interpretation	*Sowa Rigpa* interpretation
JH1	Forest dominated by pine, juniper and fir. Mixed herbaceous ground flora with abundant ferns, suggesting a	Forest dominated by pine, juniper and fir. There is an apparent paucity of plants associated with the practice of *Sowa Rigpa* in this period.
JH2	Tree pollen dramatically disappears, suggesting deforestation and with subsequent evidence of vegetation indicative of unstable slopes and erosion. This occurs at the same at archaeological evidence occurs in the area. Cereal pollen suggests that people were growing crops nearby. Example: *Plantago depressa*-type and *Rumex*-type increase and are grouped under ‘cultivated plants’ and ‘ruderal weeds’.	Tree pollen dramatically disappears and diversity of herbaceous taxa increases. This landscape would have contained more elements to support the spiritual and physical well-being of people. For example *Plantago depressa* and *Rumex nepalensis*, both have medicinal qualities and energies, with *R. nepalensis* being ‘naturally sweet and bitter’ and good for sores, coughs, kidney fever, constipation and nasal bleeding (Bista and Bista, 2005); and *P. depressa* being ‘naturally sweet and astringent’ being good for dysentery, diarrhoea, wounds and to
JH3	Increase in the variety of human indicator taxa, such to include cannabis/ hemp and buckwheat.	Tree pollen increases again, but the herbaceous taxa remain, still providing the plants needed for *Sowa Rigpa*.

(Miehe et al., 2009). These may be a family, type or species on the pollen diagram, as it is not always possible to achieve species-level identification due to the taxonomic resolution of pollen data. However, of the 51 plants in Bista and Bista (2005), 12 can be related to specific types or species on the pollen diagram. Each plant is ascribed a ‘Taste’/‘Energy’ from six possibilities: sweet, sour, salty, bitter, hot and astringent. The only tastes/energies not represented in the pollen diagram are sourness and saltiness (Figure 5) – we return to this point in the discussion section. To highlight how a different interpretative framework can be used, we present three species that are known both within *Sowa Rigpa* and are present in the pollen diagram: *Rumex nepalensis*, *Swertia* sp. and *Caragana gerandiana*.

R. nepalensis. *Rumex* (sorrel) is typically regarded as an indicator of ruderal (disturbed) and pastoral environments (Behre, 1981: 236). As such, the original analysts interpret this taxa in zone 2 is as an indicator of 'dung heaps and cattle resting places' (Miehe et al., 2009: 263). This is supported by Polunin and Stainton (2014: 349) who suggest it is found on 'cultivated areas, grazed ground', although they allude to other human uses of the plant by finishing the entry with the short and intriguing statement, 'Roots used medicinally'. When we turn to information from traditional knowledge, its other qualities become clear. We learn initially that *Rumex* is thought to be both sweet and bitter, and therefore suitable for treating imbalances associated with sores, kidney, fever, coughs, nasal bleeding and constipation (Bista and Bista, 2005: 61). Further ailments that can be treated by the plant are also mentioned by Bhattarai et al. (2010: Additional Information, 11), including bone fractures, oedema, lung disease, liver, disease, joint pain, vomiting, air, wind diseases and dehydration. The intricate way that this plant is bound-up with lifeways is further alluded to by other everyday uses, including as a fencing material, vegetable and a dye.

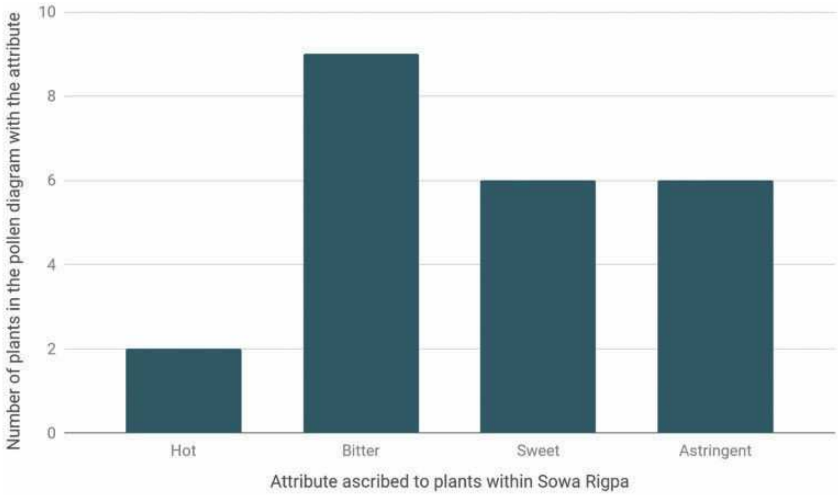

Figure 5. Bar chart illustrating the number of taxa in Miehe et al. (2009) pollen diagram that has been assigned an attribute recognised in *Sowa Rigpa* medicinal practice by Bista and Bista (2005).

Swertia sp. The presence of *Swertia* type in zone 2 (Figure 2) is regarded as indicative of 'degraded pastures' (Miehe et al., 2009). This term particularly highlights the difference between a conventional ecological interpretation and one based on indigenous knowledge. Degraded in relation to what? There is an implicit baseline in this interpretation, and it is one that is set by western ecology, although even the word 'degradation' will be understood differently by different groups, such as ecologists and policymakers (Davidson et al., 2008). An entirely contrasting view of this plant is gained when we a take locally situated view from Bista and Bista (2005: 69). Within the practice of *Sowa Rigpa* in Mustang, three types of *Swertia* sp. are recognised, with *Swertia* mussofi occurring commonly within Mustang. The plant is ascribed a taste/energy of being 'naturally bitter', which is reflected in its local name, *Zang tik*, where '*tik'* or 't*ig*' is used in naming medicinal plants that are naturally bitter tasting (Lama et al., 2001); it is also used to treat bile disorders (Bista and Bista, 2005: 69).

Another species known from Mustang, *Swertia macrosperma* (Tithe), is described as good for treating coughs, colds and fevers (Bhattarai et al., 2010: Additional Information, 8). In addition to the information from local *Amchi*, nomadic yak herders in Mustang list four types of *Swertia* that are used medicinally (Acharya and Kaphle, 2015). One type, *Swertia chirayita* is used for indigestion and fever and is a treatment for yaks as well as humans, emphasising the interwoven nature of relationships between humans and non-humans.

C. gerandiana. *Caragana*-type is recorded in zone 2 in the pollen diagram (Figure 2) following the decline in woodland. Whilst the exact species cannot be identified, *C. gerandiana* forms low scrubby, very prickly, bushes in the area in the present day and is recorded in Bista and Bista (2005), along with *Caragana brevifolia*. Ecologically, *Caragana* sp. is typified as indicative of 'open dwarf shrublands'. *C. gerandiana* is used for treating fever (Bhattarai et al., 2010: Additional Information, 8) whilst Bista and Bista (2005: 60) suggest that it is 'naturally sweet, bitter and astringent' and is therefore 'suitable for the imbalances of blood disorders, effective for five organ diseases'. Interestingly, they also suggest it is 'commonly used as a firewood'. The local knowledge of this prickly plant illustrates that it had/has the capacity to help support the well-being of people, in both a medicinal and practical or 'functional' sense – and it also suggests that even after the landscape became relatively treeless (after zone 1 in the pollen diagram, see Figure 2), fuel was still available, and therefore brings into question the assumption that it had become 'degraded' after Zone 1, again raising the question: 'degraded' for whom?

Discussion

In a broad summary of the original ecological interpretation of the pollen diagram (Table 3), the environment around the Jharkot sampling site changes from closed pine and juniper forest, to an open, 'degraded' landscape during the mid-fourth millennium BC. Within this framework, 'human impact' is implicated as the causal agent of change as past people cleared woodland for farming, settlement and cul tivation. It can be observed that the language employed in the original article carries essentially negative connotations – degradation, wastelands, degraded pastures – terms that also carry an implicit teleology in the sense of a decline from an essentially 'natural' (pristine?) woodland ecosystem to the current 'treeless rangelands' as a result of several thousand years of human 'mis-management' of the landscape.

Identification of past 'human impact' on past environments is a central theme within palaeoecology (and Quaternary science more broadly). Although this expression might seem relatively uncontroversial, Head (2008: 273) presented a critique of the concept 'human impact', arguing that: 'The metaphor is neither conceptually nor empirically strong enough for the complex networks of humans and non-humans now evident, in prehistoric as well as contemporary time frames'. This paper proposed that reflection on the use of this term and related concepts was important for a number of reasons, not least that it carries an implicit resonance that 'the social and the natural are pre-existing categories prior to their interaction with one another'. In the context of the Mustang pollen diagram, the original 'human impact' interpretation carries the implication that the relationship between the past and present inhabitants of this 'desert-like' area and their environment is one of disconnection. The landscape has been degraded and by inference we might assume that the inhabitants (past and present) are similarly constrained by living within it.

Taking such a linear and unidirectional view to how people and the landscape co-exist has been challenged from various directions, but in particular, the field of political ecology has explored how society, politics and the environment are enmeshed, the tensions that exist between these elements and how these are played out by local communities and the non-local, or wider society (Bailey and Bryant, 1997; Blaikie and Brookfield, 2015; Khan, 2013; Wolf, 1972). Not only do interests and motivations vary between these groups, but the language that is used is different because of the varied backgrounds and influences. The non-local discourse is often highly politicised, whether this is conscious or not. An example of this can be seen in the work of Leach and Fairhead (2000: 18) in West Africa where 'neo-Malthusian deforestation narratives misrepresent the relationships between people and forests', and instead, at a local scale, the relationship between people and forests could be seen to be 'variable, nonlinear and unpredictable' (Leach and Fairhead, 2000: 39) and it should be questioned as to how these wider and often dominant 'narratives arise and become entrenched' and how they 'serve institutions and individuals who deploy them' (Leach and Fairhead, 2000: 40). Leach's work (e.g. Leach and Fairhead, 2000 and Leach and Mearns, 1996) was particularly concerned with the narrative of deforestation and degradation, but the term 'degradation' has also been subject to further analysis and questioning (Blaikie and Brookfield, 1987, 2015), especially that 'environmental change may or may not be experienced as degradation depending in part on the use to which the land is put' (Jones, 2008: 672). Developing this line of thought, the wider vegetative landscape in Nepal is often seen differently depending upon who is viewing it, for what reason and at what scale. With the Tamang in north-central Nepal, Campbell (2010) argues for a more locally situated 'environmental subjectivity' that explores aspects of human–environment relatedness as a counterpoint to larger scale political narratives. He observes that local 'subjectively lived worlds' in the Himalaya can be seen as 'many natures participating in a single culture, rather than many cultures relating to a single nature'. Whilst many of these ideas have been debated and discussed within the fields of political ecology, human geography, anthropology and development studies, they are ideas that have been poorly taken up (if at all) in palaeoecology

However, if we take a more subjective approach to palaeoecology, in-line with those discussed above, where the pollen data are viewed using the local botanical system of *Sowa Rigpa* different interpretations emerge. Instead of the landscape 'degrading' with the transition from a wooded to an open environment, we can see it becoming one of potential in terms of its ability to support the spiritual and physical well-being of both the human and non-human. This brings into sharp focus the normative assumptions that underlie interpretations of past human activity and concepts such as 'degradation', in much the same way as has already been undertaken for more recent landscapes (see above). 'The Medicine Tree' highlights only one way of interpreting the past and present landscape, but underlying this is the fact that localised nomenclatures are often based on complex relationships between resource management, conservation principles and how people perceive their natural environment (Ghimire and Aumeeruddy-Thomas, 2010). Research undertaken to the west of the study area, in the Dolpo region of Nepal, found that the *Amchi*, practitioners of the traditional medicinal system of *Sowa Rigpa*, 'not only give importance to morphological characters, but also relate to other locally perceived ecological and biochemical characteristics' (Ghimire and Aumeeruddy-Thomas, 2010: 64). Taxonomic systems and associated perceptions of particular plants are intrinsically socially and culturally specific.

Plants form only one part of this interconnected landscape, and only one part of the *Amchi* medicinal system. Bista and Bista (2005: 41) make it clear that they themselves are concerned only with the qualities of plants, whereas *Amchi* medicines are also drawn from animals and minerals. For example, the parts or products from 17 animal species have been recorded by people from Mustang as having medicinal properties (Paudyal and Singh, 2015). Figure 5 illustrated four of the six tastes and energies found in the pollen diagram around Jharkot; one notable taste/energy that cannot be provided by plants is salt, but this would have been available locally. Mustang sits on one of the major trading routes between China and India in the Kali Gandaki valley (see Figure 1) and historically this has been used for trading salt, animals and grain (Fisher, 2001). Salt has also been produced locally from the natural brine springs in Chusang (see Figure 1), reportedly for hundreds of years – salt produced from the recently closed mines in the area has been described as having 'medicinal properties' (Anon, 2009). Both examples illustrate the need to look beyond palaeoecology when looking at landscape interpretation.

A conventional palynological interpretation accurately draws attention to eco logical processes but does not permit us to acknowledge that plants are/were enmeshed in wider networks of being and belief. When we interpret the pollen diagram using *Sowa Rigpa*, we are drawing on a perspective rooted in this indigenous context – both types of interpretations may exist side by side. The emphasis is on opening-up interpretive horizons by including other types of data and perspectives.

The most important point is that a plurality of interpretations can exist, which can lead to a more nuanced and richer interpretation of past landscapes. Perhaps this also foregrounds the concept that 'landscapes' are always composed of 'discontinuous and contingent histories' (DeSilvey, 2012: 36). It is not possible to examine the multiple interconnections that existed between people and the natural world in the past, but this is not to say that they are not without relevance and importance; ultimately, if as palaeoecologists we want to strengthen ties with archaeologists, historians and local communities, then it also becomes important to establish ways of working that incorporate non-western or pre-enlightenment worldviews. Past landscapes only have the identity that we imbue them with in the present: the *Sowa Rigpa* landscape does not exist *per se*, but setting it up as a comparison to the 'ecological' interpretation illustrates that there are different, culturally situated ways to perceive environments in both the past and the present. These are almost certainly not mutually exclusive and are likely dependent on a person's needs/views at the time; for instance as shown above, *C. gerandiana* and *R. nepalensis* can be used for functional and medicinal reasons.

Taking an openly subjective approach to the past and allowing alternative interpretative perspectives to settle alongside those of palaeoecology also allows other voices to be acknowledged and can start to 'flatten out' some of the pre-existing knowledge/power structures. This may be especially significant for a region where the relationship between people and 'nature' is largely determined by authority and the concomitant power structures that accompany it (Nightingale and Ojha, 2012; Schuett et al., 2016). Whilst the ACAP works to a large extent, the existence of

'deeply entrenched asymmetric power relations between ACAP staff, management and marginal groups' (Schuett et al., 2016: 144) means that 'the lowest social hierarchies ... have not been able to have their voices heard in public discourse' (Schuett et al., 2016: 144). How such power structures might be opened up are beyond the aims of this paper; however, by incorporating a range of perspectives and scales (local, archaeological, traditional palaeoecology) in an interconnected and iterative process, it challenges the dominant discourses that ultimately may play a role in helping to re-situate people in terms of longer term trajectories of landscape change, with possible benefits beyond the intrinsic concerns of palaeoecology.

Conclusions

In the case study presented in this paper, we have explored how 'changing the lens' through which we interpret apparently 'neutral' scientific data can 'unsettle' a conventional interpretation of a pollen diagram rooted in Western ecological interpretative frameworks, to one that draws on indigenous knowledge, derived from an understanding of the potential of the landscape to support the health and well-being of its inhabitants. Whilst we cannot, by definition, escape our mental 'enframing' of the world, we can acknowledge different ways of knowing, which open up interpretative space for 'other' ontologies. This also foregrounds the fact that whatever interpretative perspective we adopt, past environments only exist within the context of our enquiry within the present and this is always subjective. The observation that 'the past only exists in the present' is an aspect of archaeological inquiry that has long been debated (e.g. Johnson, 2010) but has seen little reflection within palaeoecology. Whilst it might be argued that such theoretical consideration adds little to the practice of palaeoecology, we would suggest that critical reflection is important in a number of largely under-debated ways.

Related to this, in a more pragmatic sense, the case study also reminds us that our interpretation of particular plants or vegetation communities as associated with specific perceptions of utility may not easily translate to past landscapes. We cannot assume a simple linear or unproblematic link between our perception and understanding of 'proxy' environmental data in the present, and how people viewed and understood their landscape in the past. Other examples of this dichotomy can be identified. For example, the plant Urtica (nettle) is regarded as a classic 'anthropogenic indicator' (Behre, 1981), but the example above demonstrates that this term carries an implicit valuation. The appearance of this taxon in pollen diagrams is associated with nitrogen-rich soils, a weed typical of 'disturbed' ruderal sites. However, varied uses of this plant can be recognised more broadly in the archaeobotanical record (e.g. Griffin-Kremer, 2014) and the recent find at the Bronze Age site of Must Farm (East Anglia, UK) of an intact bowl containing a stew or soup made out of nettle again emphasises that this plant must have been viewed very differently in the past (see also Hurcombe, 2008: 87) and that this is dependent entirely on cultural context.

These issues may be regarded as largely irrelevant if they are viewed from a positivistic/empirical theoretical perspective. Certainly, we can never know how people perceived landscapes or plants in the past; this is entirely unattainable through any methodology or theoretical exposition. In this paper we have attempted to think about how this critique might be used to reframe aspects of our approach to palaeoecology and how we 'reconstruct' landscapes in the present. By suspending or opening up components of the prevailing conventions of palaeoecological interpretation and allowing for other systems of knowledge, we can start to explore or allow into play other perceptions and perspectives that consciously move away from narratives underlain by normative disciplinary assumptions. As outlined above, this has not been proposed as an attempt to undermine or replace 'conventional' palaeoecological interpretation, nor to suggest that our alternative 'reading' is in some sense more 'authentic' or closer to a 'true' understanding of the past landscape.

Palaeoecology and environmental archaeology remain resolutely apart from such concerns, although even this statement is problematic, as it assumes that there is a single palaeoecological 'project' in an academic sense at least. In particular, the idea of some form of unitary subject in palaeoecological study, dispassionately interpreting the facts and avoiding emotional engagement or any sort of concern with broader politics of place and being, may be usefully queried. Examples exist of archaeology consciously engaging politically (e.g. McGuire, 2008) and of political ecology drawing attention to the various power interestsand discourses within environmental narratives (e.g. Campbell, 2010; Leach Fairhead, 2000), and whilst palaeoecology has little tradition to date of this at all, there has been a call for using time series to challenge such received wisdoms and discourses (Leach and Mearns, 1996: 5). Coupled with the current politics of climate change, climate change denial and 'post-truth' era, positions of 'neutrality' may no longer be desirable or tenable (Riede et al., 2016) within palaeoecology.

By definition we will always remain rooted in a western scientific paradigm interpretation/process and the approach adopted here might itself be critiqued: neither of us are Nepalese Buddhists and our appropriation of 'The Medicine Tree' might therefore be regarded as a form of academic colonialism (Atalay, 2006). Probably the best response to this is to expose this aspect of our own motivations. Foucault (1977) argued that discourse is concerned with the political currency attached to certain meanings or systems of meaning, in order to invest these with scientific legitimacy, hence there is nothing inherently neutral about science. Braidotti (2013: 27) posits that this is key because: 'a critical materialist link is established between scientific truth, discursive currency and power relations'. In the words of Olsson et al. (2015: 7), we are not advocating a unification of ideas that 'can easily slip into not-so-useful scientific imperialism' but a pluralism that acknowledges multiple perspectives. In turn, this may relate to problems with reconciling or relating the 'conceptual' and the 'empirical', which have been much discussed in anthropology; Strathern (1988), for example, argued against defining indigenous concerns in terms of western 'typologies' but also against replacing those terms with indigenous categorisations. This can be reframed as the concept that: 'in theory different world views may be in play, but in practice, different knowledge can co-exist, even where there is no shared conceptual grounding' (Bruun Casper, 2012: 17). In other words, the process rather than the product moves into the foreground and is represented as a negotiation or active and ongoing dialogue between different perspectives.

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Note

1. The age-depth model (Figure 3) was created using the *P_Sequence* (Bronk Ramsey, 2008) function in OxCal version 4.2 (Bronk Ramsey, 2009); this assumes that the deposition of the sequence was random. The model, which uses the IntCal 13 calibration curve (Reimer et al., 2013), has good overall agreement (Amodel: 97) illustrating that there is a good fit between the radiocarbon dates. The age-depth model was constrained at the top using the approximate date at which coring was undertaken. The wide range in the uncertainty of the interpolated age-depth model below 1.7 m reflects the lack of radiocarbon samples in the lower portion of the core. The model has been used to provide modelled estimates for original radiocarbon determinations (Table 1) and the pollen assemblage zones (LPAZs) (Table 2).

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