

Science, Environment and Empire History: Comparative Perspectives from Forests in Colonial India

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BOOKS REVIEWED IN THIS ESSAY

Arun Agrawal
*Environmentality: Technologies of Government and the Making of Subjects.
(New Ecologies for the Twenty-first Century)*
Durham, NC: Duke University Press. 2005. \$22.95. xvi + 325pp.

Peder Anker
Imperial Ecology: Environmental Order in the British Empire, 1895–1945
Cambridge, MA: Harvard University Press. 2001. \$67.00. vii + 343pp.

David Arnold
*The Tropics and the Traveling Gaze: India, Landscape and Science, 1800–
1856. (Culture, Place, and Nature)*
Seattle: University of Washington Press. 2006. \$50.00. xiv + 298pp.

Gregory A. Barton
*Empire Forestry and the Origins of Environmentalism (Cambridge Studies in
Historical Geography, 34)*
Cambridge: Cambridge University Press. 2002. \$65.00. xiii + 192pp.

Richard Drayton
*Nature's Government: Science, Imperial Britain, and the 'Improvement' of
the World*
New Haven: Yale University Press. 2000. \$50.00. xxi + 346pp.

S. Ravi Rajan
*Modernizing Nature: Forestry and Imperial Eco-Development, 1800–1950
(Oxford Historical Monographs)*
Oxford: Oxford University Press. 2006. \$105.00. xv + 286pp.

I. INTRODUCTION

The growing body of historical research on forests, forestry and imperialism in south Asia has yielded many interesting debates that have now come to inform other historical fields such as social history, labour history, legal history, the history of nationalism, and the history of science.¹ But an enduring argument has focused on the relation between the growth and development of scientific ideas relating to forest management and conservation – with consequences for the rise of varieties of environmentalism – and technologies of natural resource management, or appropriation, in the period of modern empires in South Asia.² The argument has been invigorated by new scholarship on the history of empire forestry.³

In much of the existing work on India's colonial environmental history, concerns about how transnational flows of ideas and trained personnel generated a cosmopolitan, professionalised, international environmentalism have been juxtaposed with regional and local political struggles over forests and the lives associated with them. Commenting from the spectator's perspective of a North American environmental historian, Paul Sutter summarises this well when he notes much of the extant history debates 'the importation of a scientific model of forest conservation by the colonial state' that drew Indian peasant societies 'into an endemic cycle of protest and conflict with an interventionist state.'⁴ This apparently simple formulation can do injustice to a literature that, in the words of another expert commentator, 'lead(s) the world in methodological and theoretical insights into environmental history.'⁵ It is the collective enterprise and accomplishment of the specific works that are examined in detail in this essay to not merely complicate the already subtly shaded picture of landscapes, environmental changes, and flows of ideas and power in colonial India. They chart the exciting new terrain that environmental history enters when it draws upon cultural history, agrarian history, and histories of power and science-in-practice informed by post-structural theory.

Without presuming that environmentalism was merely a modern ideology at the service of colonial state formation, or that it was a product of European scientists and colonial officials encountering nature in the orient, the works reviewed here make so bold as to ask: how did foresters, colonial officials, political elites and ordinary villagers, working together, or in opposition, in late-colonial forest locations develop something that in postcolonial parlance could be recognised as environmental awareness? How did they, in other words, become environmental or nature-sensitive subjects in the modern colonial encounter? I would like to suggest answers to this question are being formulated in new scholarship on nineteenth- and twentieth-century Indian environmental history, especially on those grounds where this history meets the history of science and government in colonial empires. Corresponding revisions in the history of science and its

relationship to colonial encounters complement these works and the tasks they perform in the context of environmental history.⁶

A notable strength of south Asian environmental history at this moment is its avid pursuit of the complex exchanges through which ideas about landscape and its management emerged in the colonial experience in India. This pursuit admirably takes place simultaneously on multiple inter-connected fronts that in disciplinary terms may be identified with the sociology of knowledge, or history of science, while linking such intellectual or cultural history to material and ecological histories of landscape and correlated social transformation in India from early modern times through the twentieth century. By engaging in such a project, south Asian environmental history offers an illustration of alternate histories of empire that Nicholas Dirks has recently argued for when he notes, ‘fundamental notions of European modernity – ideas of virtue, corruption, nationalism, sovereignty, economic freedom, governmentality, tradition and history itself – derive in large part from the imperial encounter ... imperial history must engage the insularity and autonomy of the sovereign assumptions of national history.’⁷

In the spirit of the appeal issued by Dirks and Ann Stoler, among others, the emerging debates in Indian environmental history participate in a wider revision that invites scholars to consider the possibility that modernity – and its storm troopers, modern scientists – did not create an ineluctable process whereby mysterious forces were progressively diminished and all things were mastered (as Max Weber, and various other critics of modernity, would have us believe) by calculation.⁸ And if modernity itself has now to be redefined to encompass the co-production of reason and magic, the routes taken by these processes also cannot be traced unidirectionally. When colonial historians treat metropole and colony as one analytic field, it becomes evident that ‘innovations in political form, and social imaginary, and in what defined the modern itself, were not European exports but travelled as often the other way around.’⁹ Such a view of what Michael Saler has so aptly dubbed ‘the problem of modern enchantment’ is not only emerging from colonial histories or histories of the world from its purported margins in modern times. As he notes, historians of science, religion and popular culture have eroded many simple oppositions, forcing recognition ‘that modernity is characterized by fruitful tensions between seemingly irreconcilable forces and ideas ... and a modern enchantment might be defined as one that enchants and disenchants simultaneously’.¹⁰

As scholarship on India’s colonial environmental history moves in step with these broader theoretical directions it has proffered several new questions and modes of analysis. Specifically, I suggest that the work reviewed here illuminates the fruitful intersections of environmental history with topics like visual culture, science-in-practice, critiques of development, and everyday forms of power. A turn to cultural history as part of landscape history or the history of science,¹¹ or the study of the politics of representation to build upon the political economy

focus of earlier work,¹² are fitting examples. The careful consideration of ways in which the history of natural sciences is embroiled in the history of colonial conquest and colonial life is another illustration from much of the recent literature, of scholarship that would resist the temptation to identify over-determining trends, influences and flows.¹³

The patterns of coexistence, amongst modes of being across the oceans, were mutually shaped as merchants, religious specialists, soldiers and amateur scientists from both continents encountered each other with growing frequency and intensity in a variety of contexts conjured by modern enchantments. As Bayly notes, 'knowledge of geography, resources and statistics, was accumulated by pre-colonial regimes in much the same way as future British conquerors'. He goes on to note, discussing several dimension of the information order in eighteenth and nineteenth century India, that practical reason co-existed with a fascination with marvels. Thus, 'newswriters were expected to report strange events in the animal, vegetable or mineral world ... to eighteenth century Indians, the collection of such information was an entirely rational act, but it was rational, of course, by reference to certain cosmological assumptions'.¹⁴

I am concerned here with not only the varied sources for the colonial history of knowledge, science, and specifically forestry or environmentalism. Such histories undoubtedly debate when and to what extent magical or traditional or ineffective Indian appreciations of nature, landscape and natural resources gave way to rational, measured and systematic appreciations of the land and its products. The complication of these debates is surely a salutary development in current literature. However, other influences are equally relevant to this essay. Once environmental history is woven more intricately into social, agrarian and cultural history, new sources are available and new trajectories and reversals are detectable in the way land, forests, animals, and their material or symbolic worth is assessed.

A call to so interweave social, agrarian and environmental history was made in the mid-1990s for US environmental history.¹⁵ It was reiterated in fascinating ways a decade later in an anniversary forum of the journal *Environmental History*.¹⁶ South Asian environmental history, in the same period, 1996–2006, has demonstrated one way that this integration of histories might be accomplished. New scholarship from the mid-1990s onwards, especially when drawing empirical evidence from the great river valleys and central Indian or south Indian plateaus, finds it harder to sustain any simple arguments about pre-colonial equilibrium between natural and social systems. Many regions of India did, however, witness sharp transformations in agrarian relations, with noticeable and potentially irreversible changes in attendant relations between forests, farms and pastures, and altered patterns of political control of land that emerged under the early Company state. For example, tea and coffee plantations in Assam in the east and in the southern high ranges by the 1840s were strikingly new, with plantation crops requiring significant forest clearance and the import of labour

from other, also often forested regions, where reservation and regeneration of wood lands was underway.¹⁷

Richard Grove documents the prolonged British encounter with peninsular and coastal India, along both the Coromandel and the Malabar coasts. A theme that Grove develops in his study on a British empire scale, and which I was able to pursue with more assiduity in one part of the country, is the way in which India in particular became the laboratory and field research station where many aspects of silviculture, horticulture, arboriculture, soil sciences, forest hydrology and entomology were experimentally developed in the nineteenth century.¹⁸ In the late eighteenth and early nineteenth century amateur British scientists in India made serious contributions to meteorology, tropical medicine, geology and cartography, as well as botany, zoology and ethnology.¹⁹ The availability of these histories of science and their colonial refinement is important for my argument because it meant that environmental history, by the late 1990s, was no longer easily written as another story in the history of colonial domination and indigenous resistance – that is, as a sub-theme of liberal or Marxist nationalist historiography.

II. CULTURAL LANDSCAPES

Histories of science, as they pertain to forests, animals or tropical medicine, now embedded admirably in regional or topical histories, are unavoidably caught up in questions relating to the experience of colonialism, the nature of everyday forms of power in the colonial period, and the patterns of enunciation whereby knowledge and expertise were adumbrated or recognised. In *The Tropics and the Traveling Gaze*, David Arnold confronts this question from the perspective of science studies, focusing on ideas of improvement and tropicalisation, to challenge power-sapped descriptions of regionalisation that may be bolstered by the writings of Eugene Irschick and Chris Bayly among others.²⁰ He argues, quite forcefully, that ‘it would be a mistake ... to presume indigenous ideas and agency had an equal role or that some kind of open, mutually respectful discourse existed between Indian science and its European counterpart’. Arnold’s examples, admittedly, come mainly from botany and landscape representation.²¹ However, a science-as-practice approach to how expert knowledge and related governmental technologies are produced has many attractions. Such an approach can be more attuned to changes in landscapes and the role of both local exigencies and empire-wide professional confabulations in the production and legitimation of scientific regeneration and conservation policies.²²

To take but one recent example, Brain Caton’s fascinating account of veterinary medicine and animal breeding in Panjab does acknowledge the marginalisation and control of Indian practices of animal healing and care by colonial veterinarians.²³ Animal health, especially of draft animals and dairy

cattle, was directly of concern in a situation where the agrarian economy was the object of intense attention. Caton goes on to show that the English veterinarians, and authors of the Indian Cattle Plague Commission report, faithfully reproduced the language of improvement that presaged certain paternalist and violent interventions.²⁴ As Timothy Mitchell reminds us, talking of USAID in Egypt in the later parts of the twentieth century, the discourse of development presents itself as a 'detached center of rationality and intelligence'. But it is hard to detach such technical intelligence from the relations of power needed for its operation, and this in turn calls for the objectification, the making corporeal and solid, of targets – be they people, landscapes, or systems of cognition and comprehension – that must be addressed and possibly changed, and certainly subjugated, in other words, controlled.²⁵

Arnold's *The Tropics and the Traveling Gaze*, like Agrawal's *Environmentality* for a later period, brings to the forefront the issue of landscape representation and how a focus on these cultural and imaginative productions of nature, landscape, tropical forests and so on, were important to both colonial understanding of the lands they came to rule and manage, and scientific endeavours to improve, regenerate and classify these lands in service of natural sciences and colonial government. Arnold also anticipates Rajan's *Modernizing Nature* by focusing on botany and how travel writing and amateur botany combined in producing descriptions of flora, vegetation, farming and more generally the natural world. Seeing, gazing upon, reading landscapes was a material enterprise in that such modes of culturally shaped apprehension and interpretation of landscapes usually preceded specific efforts to transform them, none more important than the effort to improve them. Arnold notes, 'like the Romanticism with which it was so intimately associated, "improvement" was one of the foundational influences of the period and one of the principal links between such seemingly diverse (but broadly "environmental") fields as botany, agriculture and even (given its historical and symbolic location within idealized topographies) religion'.²⁶

Interacting with Romantic, and then pre-Victorian, ideas about landscape and nature in England, the ideas of these British travellers express the anguish, commitment and pleasures of the educated British subject trekking through dangerous and inclement Indian forests and swamps. These travelling scientists and officials were forging a sense of human place in the natural world, as they shuttled between metropole and India, juxtaposing a growing awareness of rural England or Scotland with the tropical lands encountered and documented in India. Multiple places were being made in these movements: a place in England (most often) in the British Isles, a place in India (with some difficulty) in the tropical world. But these skilled itinerants were also making a place in the intensely mobile world of empire building with all its commitments to inventory, improvement and commerce. As Arnold notes, 'the quest for visual vantage points, the better to understand and represent the configuration of land, the appearance of sky and vegetation, or the human impact on nature, was a recurring motif in the

literature ... a demonstration of the importance attached in the late eighteenth and early nineteenth century to the ocular authority of the traveller'.²⁷

In his choice of topic, period and emphasis, Arnold makes some felicitous combinations. It is not hard to accept that the observations and writings of official, scientific and commercial travellers in the early nineteenth century created the language and representational repertoire for the consolidation of empire that followed in the latter part of the century via more instrumental means like the railways, the telegraph and forced relocation of vast numbers of labourers in areas of industrialised agriculture and plantations. Another intriguing claim, perhaps not as persuasively established, is that travelling was constitutive for colonial science—the mobility of the budding scientists somehow making the science they did imaginable and possible. He writes, 'in the early 19th century much of the work of subordinating and appropriating India was conducted ... through such means as travel writing'.²⁸ In contrast to the happy memories of Mary Ledzion a hundred years later, Emma Roberts and her contemporaries wrote extensively about the high personal cost of empire, reporting on the untimely and swift death of young officers, travellers and spouses, in the tropical climate.²⁹ Her account leads Arnold to observe that given the number of promising scientific careers cut short in India by tropical disease, 'botanical texts, with their attendant eulogies and dedications, thus became memorials to the dead'.³⁰

Arnold also provides an early nineteenth century genealogy to the doctrine of improvement that is discussed in greater detail by Drayton's *Nature's Government*. As he argues, this doctrine was well established in India by the 1830s. It signified a desire to transform the country into something akin to the rural landscape and agrarian economy of contemporary England. William Carey's initiative in setting up the Agricultural and Horticultural Society of India in 1820 revealed the confluence of the idea of improvement with evangelism. By stressing the role of improvement and attendant landscape transformation, Arnold thus takes issue with the stress placed by Richard Grove and Ravi Rajan on desiccationist alarm about deforestation as motivation for the emergence of environmental conservation ideas in colonial India during the rule of the East India Company (prior to 1857).³¹ Tropical landscapes inspired both fear and fascination, from Cook to Wallace, and later Humboldt and others, and Arnold finds those tropes again, though in the culturally located context of early nineteenth century India. Landscapes in which the marks of habitation, cultivation and civilisation's detritus are hard to ignore require a lot of imaginative work if they are to appear wild and primitive and in need of improvement. David Arnold shows how that work of imagination became possible and the forms it took in epistolary, scientific and bureaucratic writing.³²

III. EMPIRES OF SCIENCE

In contrast to Rajan's *Modernizing Nature*, Arnold is quite clear that 'there is less of a presumption now that science in the colonies meekly followed or imperfectly replicated metropolitan science' or that it was the empirical field agent in the periphery for theory-building in the core.³³ In this regard, Arnold supports an emerging position within the history of science. As Roy Macleod summarises, the history of imperial and colonial science has become a new venue, 'reflecting a convergence of interests among scholars in world history, the history of medicine, the movement of global capital, and the history of environmental change'.³⁴ Earlier diffusionist ideas were challenged notably by Lewis Pyenson but as debates became more nuanced, critics of Pyenson's position, that the exact sciences were not influenced in their development by colonial experiences, asserted that, on the contrary, 'colonial expansion, with its investment in geophysics, meteorology, and astronomy, was vital to the progress of the exact sciences in Europe; and that in any case, European imperialism underwrote the global exercise within which the exact sciences flourished'.³⁵ Through the lives of Nathaniel Wallich, Hugh Falconer and John Forbes-Royle, and notably Joseph Hooker, Arnold shows that the field experience in India and crucial connections in the British aristocracy were often parlayed into positions of great influence in metropolitan science – where these colonial entrepreneurs became friends with Charles Darwin and Alfred Lyell and others who went on to produce the great synthetic tracts and conceptual breakthroughs. Extensive correspondence and frequent meetings in London or Edinburgh ensured that metropolitan scientific advances remained indebted to colonial materials, findings, researchers and their peculiar insights from endless travel, observation, collection and botanical experimentation.³⁶

Moving into the later part of the nineteenth century and the first decades of the twentieth century, Rajan's *Modernizing Nature* and Barton's *Empire Forestry* offer contrasting studies of the role of metropolitan science in shaping colonial forest management. In doing so they draw upon much the same materials like the *Indian Forester* and similar technical government and professional publications. Rajan's statement that 'scientific institutions, communities and disciplines concerned with colonial resource management remain understudied' provides a useful point of departure for his work, though the statement can be effectively disproved by a careful reading of much of the literature Rajan cites.³⁷ He offers a criticism of the scholarship (notably Marxist and nationalist) that considers science to be 'tools of empire' and judges science as a form of systematic and experimental knowledge merely by the service it may have provided to the consolidation of imperial rule. Like Barton, Rajan has a keen eye for the development of forestry in Africa, Asia, Australia and North America where Indian foresters created colonial or state managed forestry operations inspired by Indian models. And like Drayton and Anker, Rajan is interested in many of the world-

historical questions of colonialism, science, and pan-colonial or transcontinental institutions that emerged in the early twentieth century for co-ordinating and disseminating natural resource management science across the globe. But at its heart, *Modernizing Nature* is about the empire forestry conferences held from the 1920s through 1950s, and how they served as an institutional frame for empire forestry to emerge as a scientific tradition and presumably ideology informing colonial forest governance in different regions.³⁸

Like Barton, but with a greater focus on the European antecedents, Rajan shows that by the early nineteenth century there was a well-developed field of inquiry that linked deforestation to floods and variations in local climates (especially rainfall) and catalogued the depletion of woodlands and pastures by the spread of intensive agriculture. Much of the field study in support of these ideas was undertaken by French scientists and engineers working in Alpine areas. As he notes, quite correctly, by the time GP Marsh wrote *Man and Nature* he was able to synthesise a century's worth of scientific work by hydrologists, botanists and physiologists in describing the effects of human activity on nature or wilderness. But none of these people worked outside a Baconian presumption that the natural world was God's gift to human civilisation and was to be utilised to sustain the progressive development of human life on earth.³⁹ It appears there emerged a 'contract with nature' – tending in return for higher yields of things useful to humans; and there was secularisation of nature – its values were increasingly seen in terms of economic attributes and less in terms of spiritual or habitation qualities and services.⁴⁰

Rajan is clearly sympathetic to Richard Grove's basic claim that colonial conservationists and scientists played a key role in establishing forest conservancy in India, then in Africa and the rest of Asia and even in Australia and the Middle East. And their motivations were arguably aesthetic, environmental and moral, and only secondarily economic. Rajan feels, however, that Grove does not do enough to clarify these motivations and fails to link them adequately to continental scientific developments and emergent European environmental sensibilities. He goes on to discuss the work of these colonial scientists and their close attention to local practices in physical chemistry, agronomy, plant taxonomy and animal husbandry. In a direct repudiation of Grove he argues that 'the onset of environmentalism as a state concern in the empire ... was facilitated by an explicit reference to European precedents ... to get colonial governments to adopt the technological and legal regimes of environmental management that were already in existence in Europe'.⁴¹ Rajan, however, fails to take into account the other influences on actual forest outcomes. Training manuals and policy declarations may have shown considerable influence of continental ideas and techniques; patterns of state formation in the colonies clearly mimicked in certain aspects processes informing the emergence of modern nation-states in Europe. He rightly identifies the emergence of a technocracy within forestry and the consolidation of technocratic interests within the colonial state-system.⁴² Rajan

additionally does show, valuably, that this professional cadre had an international character and outlook – global in perspective, multinational/empire-wide in its experience and practice.

He describes well the emergence of an empire development enterprise focused on specific commodities but also on creating relations between scientific research in the metropole and colonial government in the far-flung empire. This had its own effects on new attitudes to woodland management in Britain itself, and may have been driven by the huge expansion of wood and timber imports into the British economy in the later part of the nineteenth century.⁴³ He shows, further, that the empire forestry conference was born out of acute concern in Britain about wood supply for the domestic economy.⁴⁴ The interesting things that come out of the empire forestry conference are: a) the reiteration of the need for forest reservation (which in the 1920s and 1930s is mostly a done deal in India) and b) better working conditions (as in more autonomy) for foresters in these reserved forest areas. There seems to be very little reporting of the vicissitudes and changes in forest management over the preceding decades where reservation had followed a slow, tortured and often unpredictable path. What emerges clearly from the work of Rajan, though, is the periodisation. After World War I forestry and the ecological sciences go through a period of professionalisation and international exchange that creates a global cadre of professionals and training institutes (at Oxford, Yale and in various colonial locations like Dehradun in India). Combined with the efforts to promote economic and rural development in the empire, which also gathers momentum after the great depression, a period of eco-development based on emergent ecological sciences is inaugurated.

This international professional network, however, was sharing and disseminating knowledge garnered from experimentation underway through the nineteenth century in efforts to introduce exotic plant and animal species. The goal was to secure colonial economic advantage and the improvement of the landscape, and its management, by variably identified Indian farmers, herders, woodcutters and the like. The immense expanse of Indian fields, pastures, domestic animals and forests were used as a laboratory for new contributions to the biological sciences. In that sense the colonial doctors, surgeons, veterinarians, foresters and physical scientists inhabited an empire of science that they traversed through conferences, professional journals and Royal Society memberships. This empire and its modes of recognition were not far from their consciousness when colonial scientists plugged away at their remote field stations and dispensaries fighting seasonal crises and regional epidemics, or trying to prevent local disasters.⁴⁵

I am drawing here a distinction between imperial science and the empire of science.⁴⁶ The latter, in my view, was the universe of technical communication and professional validation in which scientists working in the metropole or colony (often in hierarchical relations of power between themselves) conferred and recognised their accomplishments as well as the cumulative generation of their special fields and subfields of knowledge. Much has been said about the

romantic and utilitarian influences on the development of modern environmental sciences.⁴⁷ Scholars of Indian environmental and scientific history, notably Richard Grove and David Arnold, respectively, have also examined at length the contributions made to new knowledge by colonial researchers as unified and universal sciences were professionalised.⁴⁸ But I refer here not so much either to the philosophical, or even theological, orientations of science in the eighteenth and nineteenth centuries, nor am I pursuing the source of innovations in a single scientific enterprise. I am simply drawing attention to the networks of communication in which scientists plied and multiplied their trade or enunciated their claims to relevance, authority and power in the period of inter-connected modern colonial empires. In that sense I am extending the idea that environmentalism and imperialism have a shared past in, perhaps, something called Christian naturalism, to cover some other scientific fields including tropical medicine, veterinary science and forestry.⁴⁹

Following this train of thought, Barton, unlike Rajan, offers a sustained critique of Richard Grove's *Green Imperialism*. He notes that 'Indian imperial officials inaugurated a modern forestry management system that spread from India to much of the world'.⁵⁰ By 1936 the British Empire included a quarter of the land surface of the world and, of this, forests constituted one-fourth. In India, World War I was a major watershed in the history of forests and forestry. Between 1890 and 1920 the annual revenue of the Forest department tripled, and sale to timber contractors and commercial purchasing agents went up from 600,000 cubic feet in 1896–7 to 8.3 million cubic feet in 1915–16. Concurrently the technological sophistication of forestry also increased rapidly. Heavy machinery and chemicals came to replace improvised slides, cables and biotic controls. By 1927 the separation of the foresters into a separate technocratic bureaucracy was complete and their role was consolidated in law by the Indian Forest Act, 1927.⁵¹ Empire created the enabling conditions for vast public lands to be demarcated and set aside – providing the territorial basis for environmentalism. Holistic views of society and nature, spawned in part by Darwinian theories of adaptation, also fed fears of catastrophe where the collapse of one part of the system could bring the entire system down. Barton's extensive reading of popular and amateur scientific writing in England and Germany shows that theories of climate change caused by deforestation were circulating from the 1820s till 1920s. 'It is in this milieu of broad-based discussion in scientific journals, magazines, and popular books that the climate theory was disseminated throughout the nineteenth century. No one narrow path was responsible, neither the island deforestation cited by Grove nor the group of medical surgeons working for the East India company.'⁵²

Barton goes on to argue, as I have done earlier, that colonies provided laboratories for environmental legislation and practice – colonial land and metropolitan expertise were both overabundant. In this regard he is also indebted to Drayton's *Nature's Government*.⁵³ By 1900 global approaches were being mooted to environmental problems, and Indian forestry was the show-cased experience

from which all were to learn. Barton goes on to document how the Indian experience was both described and drawn upon in southern Africa, especially the Cape provinces. E.P. Stebbing, after lengthy service in India, wrote on African forests from his vantage point as Professor of Forestry at Edinburgh University.⁵⁴ Writing in a comparative vein, Stebbing made an interesting distinction between the uses of the term savanna in India and Africa. In north India savanna had often referred to tall grasses in the clearings within sal forests, home to tigers and a distinctive ecosystem. But in West Africa, Stebbing felt, highly degraded areas were designated as savanna and this encouraged forest ruination by not bringing these areas under active conservation measures. D.E. Hutchins went to Australia and wrote an influential tome on those forests in 1916, following the 1880s effort of another Indian forester. He then went on to New Zealand in 1918 and recommended Indian-style forest reservation.⁵⁵ Based on reports issued by Hutchins and other Indian foresters, Cyprus also acquired Indian-style forest legislation and management. From there the model was exported to other Mediterranean regions and Palestine where a forest service was inaugurated by the British in 1929. The Indian example and expertise was employed in Malaysia and Hong Kong, of course, but also in China where an empire forester, F. Sherfese, advised the Chinese government.⁵⁶

Another reason, then, for introducing the term 'empire of science' is to bring back under scrutiny the question of how far the modes of scientific professionalisation, or the cultures of scientific professions, across Europe intersected with imperial agendas of resource management, population control, state formation, and capitalist transformation of colonial economies in specific locations in India, Southeast Asia or Africa. Taking a cue from Richard Grove's work, but in far more assertive terms, Ravi Rajan has argued that 'the work on the forest history of the British Empire in the first half of the nineteenth century ... does not explore the intellectual links between the colonial campaign for forest conservation and the scientific work on deforestation ... in European scientific communities'.⁵⁷ While this is a debatable claim, it does raise an interesting question: to what extent does the emergence of an empire of science help explain the persistence of poorly-performing colonial planting, breeding and crop improvement programmes in the late nineteenth century? Or are we witnessing, by then, the ramification of what David Ludden has called India's development regime?⁵⁸

IV. DEVELOPMENT AND NATURE

The emergence of development, especially in the high colonial period of the early twentieth century, also signalled a new level of global economic integration built upon trade and scientific networks already noticed in previous discussions. As John McNeill puts it, 'economic integration often commodified nature suddenly. When groups of consumers, through the magic of the market,

were presented with the opportunity to buy something hitherto unavailable, they often did so. If that thing was elephant ivory, rhinoceros horn, giant panda skin, alligator hide, ostrich feathers, beaver fur, tortoise shell, whale oil, teak, or the like, then the link up between consumer and source of supply changed ecology in the zone of supply – often drastically.⁵⁹ In *Nature's Government*, Drayton similarly argues that new economies arose on the basis of the discovery of the raw materials for food, medicines, dyes and perfumes. Others depended on the importation and cultivation of favoured species. New cultures of ornament and order were equally consequences of new learning. Natural sciences and development ideologies articulated how nature might be governed in service of all this curiosity, desire, and the commerce it spawned. Botanising encountered improvement, to take up a theme already introduced by Arnold's *The Tropics and the Traveling Gaze*, and it was through service to horticulture and medical or scientific expertise that botanists found the friendship of the powerful as they joined in the enterprise of empire.⁶⁰

Drayton shows that the ideology of development that came out of the notion of improvement applied to the reformation of English agriculture and then the agriculture of proximate colonies like Ireland was fundamental to the making of British Empire. The collaboration between scientific innovators and state agencies began in the late eighteenth century. The idea of making academic gardens assist the work of economic renovation began in the German states, but reached its maturity in Sweden. Linnaeus gave botany two principal economic responsibilities. The first was the survey of new resources. He popularised the ideal of the philosophical traveller who would survey, record and sample every aspect of the natural world. Secondly, Linnaeus made botanists responsible for the acclimatisation of plants which might add to his nation's wealth and power.⁶¹ Invoking the theme of Christian naturalism that I have already mentioned, Drayton observes, 'the makers of the first British empire had found in Christianity, and their cultivation of land, a license for intrusion in Ireland and the New World. A later sacred theory of agriculture comforted those who imposed themselves on India, Australasia and Africa. The rational use of Nature replaced piety as the foundation of imperial Providence.'⁶²

Also taking up a theme that links empire, nationalism and nature conservation or forest regeneration, Drayton claims, 'conservation found easy sponsorship wherever the interests of Nature most nakedly coincided with those of the nation'.⁶³ Development was a direct response, via territorial control, to the consolidation of empire in locations. By control of technology, commerce and taxation, development also consolidated empire in its proliferating commodities and their journeys. Agriculture was the ultimate purpose of the struggle of nations of the northern temperate zone for control of the tropics. So the science of plants had much to contribute to the profitability of colonies. One priority was the discovery of indigenous plants such as rubber trees that yielded tens

of thousands of pounds sterling in exports annually since the 1880s. The other was the introduction of new cultivars.

Drayton shows how bureaucratic government converged with scientific natural management in the vast laboratories provided by improvement of empire landscapes and subjects. And he notes, 'men of science, particularly botanists, became important partners in administration, and beneficiaries of its growth ... the idea of governing Nature for cosmopolitan benefit found new vehicles'.⁶⁴ *Imperial Ecology* takes this line of inquiry into the convergence of development, imperialism and science to examine the formation of ecological sciences as products of empire and its networks. Peder Anker argues that the growth of interest and influence experienced by the science of ecology in the twentieth century has to do with empire patronage. Anker suggests that the history of ecology is best understood as a product of north-south relations but, he cautions, 'early British ... ecology represented a tangled web of both imperial and romantic views unified by a shared critique of urban life and culture'.⁶⁵ His account of the British Empire Vegetation Committee is fascinating for it shows how by the early twentieth century the language of ecology and imperialism were heavily intertwined. The Handbook issued by the Committee, prepared by Arthur Tansley, in 1926 presented Britain as the owner of its colonial properties and asserted that ecologists were needed to align empire's economy with the economy of nature.

Imperial Ecology goes on to describe the work on ecology done by Jan Christian Smuts in South Africa which was heavily psychological in orientation and strongly believed in evolution and holism as the mechanisms by which human and biophysical nature developed.⁶⁶ Holism, and its associated ideas of stable climax, emerged in contexts where the wilderness ideal was important in frontier mythology. To that extent it served modern nationalisms well. But Tansley, the ultimate critic of holism and apparent sponsor of much leftist thinking in British ecological sciences, was also not free of his own nationalist dismay at the fate of England's natural wealth. He not only wrote the original fall from grace account of forest destruction, he later engaged in practical schemes to reverse that trend, resorting to forms of environmental therapy like seed distribution and reforestation drives.⁶⁷ In April 1945, Tansley wrote a book on organised nature conservation that makes an eloquent case for designing 'home regions' for the deracinated citizen of the post-War era. The nearest national park would provide these people a taste of the home region that would result in renewing core cultural values.⁶⁸ It is clear that in this last book Tansley was suggesting a role for nature reserves as a font of national spirit and a museum where environmental history could be visited and viewed to recharge that spirit.⁶⁹

Imperial Ecology reminds us that the empire of science had plural points of enunciation and ramification and only tenuous control over a coherent universe of knowledge that it claimed to validate. Through the careful examination of these plural and multi-directional processes, we can profitably make visible the

networks of knowledge, practice and institutional forms that were generated in the colonial period. Arguably the colonial empires of science and the postcolonial empires of development had to coalesce for more singular models to emerge.⁷⁰ Let me turn, then, to the final segment of this exploration, by considering how imperial foresters, their more recent successors and villagers organised for forest conservation, developed an environmental awareness through not merely the government of nature, but what we encounter in *Environmentalism*, as intimate government resulting in the production of environmental subjects and governmentalised localities.

V. NATURE, POWER AND ENVIRONMENTAL SUBJECTS

Agrawal's *Environmentalism* offers a bold analysis of the relationship between changing government natural resource management and the spread of environmental awareness in various citizens and subjects, or the production of environmental subjectivity that occurs when people are involved in some way or another in the management of resources and nature conservation. This argument complements Rajan's *Modernizing Nature* and Barton's *Empire Forestry* in the sense that all these books pay attention to the production of environmental subjectivities in the foresters and other advocates for forest management, in the colonial period. One of very few intimate accounts of the lives of colonial foresters in India describes how the early foresters were drawn from other branches of company service, notably the army. They shared an interest in plants, animals, and the people of forest areas. In 1894 only five forest officers were over the age of forty-five and death was three times more likely to take young men untimely in India or Burma than it was in England during 1866–1895. Despite two years spent in France or Germany, training was pretty rudimentary right up into the 1930s. Most young recruits to the forest service were thrown 'into the deep' with a posting to some of the most unexplored and isolated areas of their divisions, to learn the job on the ground and at the double.⁷¹

In a more recent and formal analysis of the culture of forestry in India during 1875–1927, Benjamin Weil argues that the corporate culture of the forest service changed in favour of commercial exploitation at the expense of conservation. He notes a decline in hunting, or *shikar*, as a way to create affective knowledge about the forests and the local people.⁷² Foresters, he notes, being often from lower class families developed an institutional culture that relied on reductionist science for cachet.⁷³ Weil's inferences on the decline of hunting by foresters, their concurrently increasing reliance on professional scientific forestry and the consequent emergence of a form of remote forest government by the early twentieth century, interestingly, draw on the same sources – the official serial *Indian Forester* that began to be published in 1875 – so heavily mined by Rajan's *Modernizing Nature* and Barton's *Empire Forestry*. They are

open to challenge from different sources.⁷⁴ But he does have a point when he argues that increased bureaucratisation of forestry meant officers spent more time in offices and, 'as *shikar* played less of a role in the forester's life, so too would that emotional, visceral and integrated understanding of the forest that came with intimacy'.⁷⁵ It is this loss of intimate government and its recreation after 1931 in the western Himalaya region that Agrawal describes and theorises in *Environmentalism*.⁷⁶

The major claim made in *Environmentalism* is that 'by attending to practices of regulation more closely one may trace a more lived and living connection between subjects and power, environment and actions, and institutions and identities. Reading the politics of subject formation off social categories of gender, class, occupation and caste, serves at best to ignore how power works to create the subjects who fill these categories'.⁷⁷ The merit of this approach is to show how foresters came to know forests in new ways from their experience of managing them in India and how this altered their subjective relations with forests.⁷⁸ Like much of the preceding work, Agrawal valuably speaks to the debate around the issue of a rupture in the way forests were managed during colonial rule. But his critique of this debate is to suggest that it deals only with political economy and less with the politics of representation. So, Agrawal feels, the question remaining unanswered is: 'how did colonial rule come to consolidate a certain view of forests that became hegemonic among colonized subjects?'⁷⁹ His findings accord with other scholarship from South and Southeast Asia that what appears as a unified trend towards professional forestry on continental models at the level of empire and nation breaks into more improvised and regionally varied solutions to attain broad aims at the level of province and forest block.⁸⁰

Environmentalism makes the further important claim that the early nineteenth century accounts of forests, flora and fauna were descriptive and richly illustrated in the natural historical tradition. It is only in the late nineteenth century that accounts become more systematic, statistical and classificatory. Such numerical representations strengthened the technologies of government by facilitating four types of operations in forests: 1) forests were declared a domain fit for government; 2) forests became historical landscapes free of claims beyond indicators of yield and revenue; 3) concrete form and scope was given to obstacles like fire and disease in the making of normal forests; 4) comparison of regions became possible.⁸¹ But, having described the creation of the 'normal' forest in Kumaon, Agrawal analyses the reversal of this process from 1931, noting that by 1987 most of these Class I forests and quite a bit of reserved Class II forests came under the management of village forest councils.⁸²

In Agrawal's terminology, these village councils are part of the newly governmentalised locality (products of decentralisation) and are to be contrasted with earlier forest department custodial management. One may point out that this distinction refers merely to regulation of access to forest products. None of this bears obviously on the regeneration and composition of the forest – the other

important aspect of forest management. In describing the forest council rules and the newness of the governmental structures they created Agrawal, perhaps, overstates the case, because by his own description these rules borrowed from observed colonial functioning of *lattha panchayats*, and caste councils apart from colonial ideas about village self-administration.⁸³ Even if the rules and the contexts (forests) were new, they drew upon available models for local government and also called up local elites to recruit and staff the councils and ensure their acceptance. He discusses this as governmentalisation rather than state formation because co-operation is more important in this model than coercion. But, surely, all villagers were not co-operating or resisting? The co-operation of some may only be so that they now have the power to coerce others in the name of the state. Equally the co-operation of others may stem from desperation or resignation or strategies of current co-operation to defer the moment of future resistance. If indeed the object of the rules was to create forest councils 'joined at the hip' to the state government, why not talk about this as state formation? The distinction between government and state formation only holds if the former is defined strictly in Foucauldian terms as the conduct of conduct (discipline) and the latter equally strictly in Weberian terms as the monopoly of legitimated violence and bureaucratic forms of political authority.

Environmentality relies for the originality of its argument upon the diminution of received social categories (like caste and gender) as influences in the formation of environmental subjects in Kumaon. But both caste and gender do surface as factors shaping the way the councils work and can impact on lives of members and villagers. Agrawal's village-level survey data compel him to remark, 'the proportion of those who pay fines is far higher for women and *harijans* than for men and upper-caste individuals ... those who have an inferior status in the village and are not as strong politically or socially ... feel a greater imperative to follow rules.'⁸⁴ The analysis presented in *Environmentality* may not be equally sensitive to the changing subjectivity of foresters and villagers involved in forest councils, but what it does show is that knowledge is acquired through place-specific and experiential learning, and continuous social practice can shape belief, ideas and moral commitments.

In short the science of forest management is created as much on the ground in the everyday experience of villagers and foresters as it is invented in continental forestry schools where teachers were distilling years of experience from India, Burma and the Cape Colonies. While paying attention to the 'many different ways in which people constitute themselves'⁸⁵ Agrawal may not always attend closely to how these decisions are made within constraints, both on imagination and action. Most people think with available models and most act in a risk averse fashion, often to recreate the identity categories in which they may have been placed or imagined by more powerful social groups, their dominators, governments, families, social processes that school imagination and action and so forth. But the lesson we can take from the engaging analysis in *Environmental-*

ity, following Judith Butler, is to pay heed to temporal sequences in the relation between subjects and power, or what others may call patterns and processes, historical trajectories, cumulative impacts and the creative exercise of limited freedoms to become other than what you were created to be.⁸⁶

VI. CONCLUSION

I conclude with the work that spans colonial and postcolonial forestry and thus brings historical and contemporary questions into direct connection. *Environmentality's* historical scope and theoretical breadth are alluring and its lucid writing makes elegantly clear the lessons learned in the historiography of colonial environmental and scientific history in the last decade. Ranging from modern enchantments to the production of affective knowledge, and systems of government – of nature and people – that were imagined and implemented as part of colonial and postcolonial modernity, the new work presents a refreshing look at the relations between environment, science, empire and the human subject who is at the centre of all these grand processes and structures. In sustained engagements with constricting dualisms and binarisms, much of this work – in its insights or omissions – suggests new horizons for the field, and none of these are more promising than the one that brings Indian environmental history to a dialogue with comparative and world history conducted in a language attuned to social theories of power and globalisation.

Freed of exclusive concern with questions of domination and resistance, or indigenous and western cultures in opposition, research and discussion can be focused more on the comparative study of states of development that emerge in post-War Asia, Middle East and Africa. This can be combined, as persuasively argued by Sugata Bose, with due attention to trans-regional flows of ideas, people and power across an Indian Ocean region united in the past by colonial empires and, now, by postcolonial development and disaster regimes of the late twentieth century.⁸⁷ At least in India, the implications of these historically situated comparative approaches to the history of forests, and the environment more broadly conceived, are only recently gaining some interest. Their promise, however, is to place Indian forest history in a fascinating world history context and carry into the modern and post-modern context the examination of processes highlighted for the early modern period in recent pioneering work.⁸⁸ We have much to anticipate, then, in years to come.

NOTES

¹ An illustrative list of works that have linked environmental history to at least one another field in colonial history would include Akhileshwar Pathak, *Law, Strategies, Ideologies: Legislating Forests in Colonial India* (Delhi: Oxford University Press, 2002); Marina Carter and Khal Torabully, *Coolitude: An Anthology of the Indian Labor Diaspora* (London: Anthem, 2002); Jayeeta Sharma, *Empire's Garden: Assam in the Making of India* (Durham, N.C.: Duke University Press, forthcoming); David Arnold, *Science Technology and Medicine in Colonial India*, NEHI III.5 (Cambridge: Cambridge University Press, 2000); Mahesh Rangarajan, *India's Wildlife History: An Introduction* (Pemanent Black, 2001); Ajay Skaria, *Hybrid Histories: Forests, Frontiers, and Wildness in Western India* (Delhi: Oxford University Press, 1999); Sumit Guha, *Ecology and Ethnicity in India, c 1200–1991* (Cambridge: Cambridge University Press, 1999); Gunnel Cederlof and K. Sivaramakrishnan (eds.), *Ecological Nationalism: Nature, Livelihoods, and Identities in South Asia* (Seattle: University of Washington Press, 2006).

² The classic debates in this regard are contained in the key works published in the 1990s. See Ramachandra Guha, *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya* (Berkeley: University of California Press, 1990); David Arnold and Ramachandra Guha (eds.), *Nature, Culture, Imperialism: Essays on the Environmental History of South Asia* (Delhi: Oxford University Press, 1995); Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens, and the Origins of Environmentalism* (Cambridge: Cambridge University Press, 1995); idem, *Ecology, Climate and Empire: the Indian Legacy in Global Environmental History, 1400–1940* (New Delhi: Oxford University Press, 1998); Richard Grove, Vinita Damodaran and Satpal Sangwan, *Nature and the Orient: The Environmental History of South and Southeast Asia* (Delhi: Oxford University Press, 1998); Mahesh Rangarajan 'Environmental Histories of South Asia: A Review Essay', *Environment and History* 2, 2 (1996): 129–43, doi: 10.3197/096734096779522347; K. Sivaramakrishnan, *Modern Forests: Statemaking and Environmental Change in Colonial Eastern India* (Delhi: Oxford University Press, 1999); Arun Agrawal and K. Sivaramakrishnan (eds.), *Agrarian Environments: Resources, Representations, and Rule in India* (Durham, N.C.: Duke University Press, 2000).

³ Notable contributions in this regard have come from the books under review here and connected writings of some of these authors: Arun Agrawal, *Environmentalities: Technologies of Government and the Making of Subjects* (Durham, NC: Duke University Press, 2005), hereafter *Environmentalities*; Peder Anker, *Imperial Ecology: Environmental Order in the British Empire, 1895–1945* (Cambridge, MA: Harvard University Press, 2001), hereafter *Imperial Ecology*; David Arnold, *The Tropics and the Traveling Gaze: India, Landscape and Science, 1800–1856* (Seattle: University of Washington Press, 2006), hereafter *The Tropics and the Traveling Gaze*; Gregory A. Barton, *Empire Forestry and the Origins of Environmentalism* (Cambridge: Cambridge University Press, 2002), hereafter *Empire Forestry*; Richard Drayton, *Nature's Government: Science, Imperial Britain, and the 'Improvement' of the World* (New Haven: Yale University Press, 2000), hereafter *Nature's Government*; Ravi Rajan, *Modernizing Nature: Forestry and Imperial Eco-Development, 1800–1950* (Oxford: Oxford University Press, 2006), hereafter *Modernizing Nature*. Key writings that touch upon empire and natural science (forests, agriculture, soils, botany) in other parts of Asia, the Caribbean and Africa would include James Fairhead and Melissa Leach, *Science, Society and Power: Environmental Knowl-*

edge and Policy in West Africa and the Caribbean (Cambridge: Cambridge University Press, 2003); William Beinart, *The Rise of Conservation in South Africa: Settlers, Livestock, and the Environment 1770–1950* (Oxford: Oxford University Press, 2003); James McCann, *Green Land, Brown Land, Black Land: An Environmental History of Africa, 1800–1990* (Portsmouth, N.H.: Heinemann, 1999); Jane Carruthers, 'Africa: Histories, Ecologies and Societies', *Environment and History* 10, 4 (2004): 379–406, doi: 10.3197/0967340042772649; Peter Vandergeest and Nancy Peluso, 'Empires of Forestry: Professional Forestry and State Power in Southeast Asia, Part 1', *Environment and History* 12, 1 (2006): 31–64, doi: 10.3197/096734006776026809; idem, 'Empires of Forestry: Professional Forestry and State Power in Southeast Asia, Part 2' *Environment and History* 12, 4 (2006): 359–93, doi: 10.3197/096734006779093640.

⁴ Paul Sutter, 'Reflections: What can US Environmental Historians Learn from non-US Environmental Historiography?' *Environmental History* 8 (2003): 109–29, p. 112, doi: 10.2307/3985974.

⁵ John M. MacKenzie, 'Introduction' *Environment and History* 10, 4 (2004): 371–8, p. 377.

⁶ See, for instance, arguments for a complex reciprocity in the making of science within the colonial context. Based on the example of India during the first century of British colonial conquest, and the kinds of knowledge practices that emerged in the case of the geographical survey of India, Kapil Raj suggests that the knowledge created in this context is not just local in character, but participates wholly in the emergence of universal science, as well as of other institutions of modernity. Kapil Raj, 'Colonial Encounters and the Forging of New Knowledge and National Identities: Great Britain and India, 1760–1850', *Osiris* 15 (2000): 119–35.

⁷ Nicholas Dirks, *The Scandal of Empire: India and the Creation of Imperial Britain* (New Delhi: Permanent Black, 2007), p. 330. Dirks, of course, makes his point in response to the revisionist celebrations of colonial empire that are offered in works like, Niall Ferguson, *Empire: The Rise and Demise of the British World Order and the Lessons for Global Power* (New York: Basic Books, 2003). He could also be offering a corrective caution to the ahistorical claims of radical histories of empire as well, like the work of Michael Hardt and Antonio Negri, *Empire* (Cambridge: Harvard University Press, 2000).

⁸ Max Weber, 'Science as Vocation', in H.H. Gerth and C. Wright Mills (eds.), *From Max Weber: Essays in Sociology* (New York: Oxford University Press, 1946), pp. 129–56. For a commentary on various critical figures like Nietzsche, Eliot, Toynbee and Heidegger, see Arthur Herman, *The Idea of Decline in Western History* (New York: Free Press, 1997); and Oliver Bennett, *Cultural Pessimism: Narratives of Decline in the Postmodern World* (Edinburgh: Edinburgh University Press, 2001).

⁹ Ann Laura Stoler, 'Tense and Tender Ties: The Politics of Comparison in North American History and (Post) Colonial Studies', in idem (ed.), *Haunted by Empire: Geographies of Intimacy in North American History* (Durham, N.C.: Duke University Press, 2006), pp. 23–67, p. 41.

¹⁰ Michael Saler, 'Modernity and Enchantment: A Historiographic Review', *American Historical Review* 111, 3 (2006): 692–716, pp. 698–9.

¹¹ *The Tropics and the Traveling Gaze*, pp. 3–5.

¹² *Environmentality*, pp. 29–30.

¹³ *Empire Forestry*, pp. 33–7; *Modernizing Nature*, pp. 26–34; *Nature's Government*, pp. 108–19; *Imperial Ecology*, pp. 3–4.

¹⁴ Christopher Bayly, *Empire and Information: Intelligence Gathering and Social Communication in India, 1780–1870* (Cambridge: Cambridge University Press, 1999), pp. 21, 26.

¹⁵ See Alan Taylor, 'Unnatural Inequalities: Social and Environmental Histories' *Environmental History*, 1, 4 (1996): 6–19, doi: 10.2307/3985275. A call since answered in several outstanding studies. A few examples might be, Louis Warren, *The Hunter's Game: Poachers and Conservationists in Twentieth Century America* (New Haven: Yale University Press, 1997); Karl Jacoby, *Crimes against Nature: Squatters, Poachers, Thieves and the Hidden History of American Conservation* (Berkeley: University of California Press, 2001); Linda Nash, *Inescapable Ecologies: A History of Environment, Disease and Knowledge* (Berkeley: University of California Press, 2006).

¹⁶ See various contributions to 'Anniversary Forum', in *Environmental History*, 10, 1 (2005): 30–109. Be it by asking for more long-duration histories that situate colonialism in wider and longer processes of social and economic change in Africa (Giles-Vernick), or by suggesting that a critical evaluation of 'agency' – of nature or social forces – be central to the debates in environmental history (Nash), these scholars, I would argue, invite a reintegration of environmental history into other histories and new concerns.

¹⁷ Jayeeta Sharma, *Empire's Garden: Assam and the Making of India* (New Delhi: Permanent Black, forthcoming).

¹⁸ For more on this see *The Tropics and the Traveling Gaze*; Grove, *Green Imperialism*; Sivaramakrishnan, *Modern Forests*.

¹⁹ See, among others, Matthew Edney, *Mapping an Empire: The Geographical Construction of British India, 1765–1843* (Chicago: Chicago University Press, 1997); David Arnold, *Science, Technology, and Medicine in Colonial India* (New York: Cambridge University Press, 2000); Deepak Kumar, *Science and the Raj, 1857–1905* (Delhi: Oxford University Press, 1995); and Richard Grove, *Ecology, Climate and Empire: Colonialism and Global Environmental History, 1400–1940* (Cambridge: White Horse Press, 1997).

²⁰ Eugene Irschick, *Dialogue and History: Constructing South India, 1795–1895* (Berkeley: University of California Press, 1994); Christopher Bayly, *Empire and Information: Intelligence Gathering and Social Communication in India, 1780–1870* (Cambridge: Cambridge University Press, 1996).

²¹ *The Tropics and the Traveling Gaze*, p. 8.

²² K. Sivaramakrishnan, 'Forest Comanagement as Science and Democracy in West Bengal, India' *Environmental Values* 11, 3 (2002): 277–302, doi: 10.3197/096327102129341091.

²³ Brian Caton, 'Settling for the State: Pastoralists and Colonial Rule in Southwestern Panjab, 1840-1900' unpublished dissertation, Department of History, Philadelphia: University of Pennsylvania, 2003.

²⁴ Brian Caton, 'The Emergence of Animal Breeding and Veterinary Science in Colonial Panjab' paper presented at the Annual Meetings of the Association for Asian Studies, San Francisco, April 6–9, 2006.

²⁵ Timothy Mitchell, *Rule of Experts: Egypt, Techno-politics, Modernity* (Berkeley: University of California Press, 2002), p. 242–3.

²⁶ *The Tropics and the Traveling Gaze*, p. 6.

²⁷ *The Tropics and the Traveling Gaze*, p. 24. See also Nancy Stepan, *Picturing Tropical Nature* (London: Reaktion Books, 2001); Alfred Russel Wallace, *Tropical Nature and Other Essays* (London: Macmillan, 1878).

²⁸ *The Tropics and the Traveling Gaze*, p. 27.

²⁹ Mary Ledzion, *Forest Families* (London: British Association for Cemeteries in South Asia, 1991); Emma Roberts, *Scenes and Characteristics of Hindostan*, 3 volumes (London: W.H. Allen, 1835).

³⁰ *The Tropics and the Traveling Gaze*, p. 65.

³¹ *The Tropics and the Traveling Gaze*, pp. 104–8; Grove, *Green Imperialism*, pp. 257–69; *Modernizing Nature*, pp. 21–34, 64–67.

³² A poignant account of such awareness, not cited by Arnold, is the one provided by Leonard Woolf in the novel he wrote drawing not just on his experience as a colonial district official in Sri Lanka, but also from his diaries and letters to Lytton Strachey and others in the Bloomsbury group. This is a novel that describes with little dramatic fuss, but with acute anthropological sensibility, the ways in which the village (settled life) was overtaken by forest (disorder and disease) as an outcome of its becoming the object of civilizing processes engendered by colonial rule. See Leonard Woolf, *The Village in the Jungle* (New York: Harcourt Brace, 1926).

³³ *The Tropics and the Traveling Gaze*, p. 147.

³⁴ Roy MacLeod, 'Introduction', in *Nature and Empire: Science and the Colonial Enterprise*, *Osiris* 15 (2000): 1–14, p. 3.

³⁵ *Ibid.*, p. 4–5. Lewis Pyenson, *Cultural Imperialism and Exact Sciences: German Expansion Overseas, 1900–1930* (New York: P. Lang, 1985); *idem*, *Empire of Reason: Exact Sciences in Indonesia, 1840–1940* (Leiden: E. J. Brill, 1989); and *idem*, *Civilizing Mission: Exact Sciences and French Overseas Expansion, 1830–1940* (Baltimore and London: Johns Hopkins Univ. Press, 1993). See especially Paolo Palladino and Michael Worboys, 'Science and Imperialism', *Isis* 84 (1993): 91–102, doi: 10.1086/356375; and Pyenson's reply in 'Cultural Imperialism and Exact Sciences Revisited', *Isis* 84 (1993): 103–8, doi: 10.1086/356376. See also Roy MacLeod, 'On Science and Colonialism', in *Science and Society in Ireland: The Social Context of Science and Technology in Ireland, 1800–1950*, ed. Peter Bowler (Belfast: Queen's University Press, 1997), pp. 1–17.

³⁶ *The Tropics and the Traveling Gaze*, pp. 155–201.

³⁷ *Modernizing Nature*, p. 3.

³⁸ *Modernizing Nature*, pp. 113–93.

³⁹ *Modernizing Nature*, pp. 32–33. The reference is to George Perkins Marsh, *Man and Nature: or, Physical Geography as Modified by Human Action* (New York: C. Scribner, 1869). The best surveys of the evolution of ideas of nature in Europe and the USA remain: Clarence Glacken, *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley: University of California Press, 1967); Keith Thomas, *Man and the Natural World: A History of the Modern Sensibility* (New York: Pantheon, 1983); and Donald Worster, *Nature's Economy: A History of Ecological Ideas* (Cambridge: Cambridge University Press, 1995).

⁴⁰ Rajan here is indebted to, among others, Robert Pogue Harrison, *Forests: The Shadow of Civilization* (Chicago: University of Chicago Press, 1993); Emma Spary, *Utopia's Garden:*

French Natural History from Old Regime to Revolution (Chicago: University of Chicago Press, 2000); and Colin Duncan, *The Centrality of Agriculture: Between Humankind and the Rest of Nature* (Montreal: McGill-Queen's University Press, 1996).

⁴¹ *Modernizing Nature*, p. 68.

⁴² A point made in the past by Sivaramakrishnan, *Modern Forests*, and Vasant Saberwal, *Pastoral Politics: Shepherds, Bureaucrats and Conservation in the Western Himalaya* (Delhi: Oxford University Press, 1999), among others. See also, Benjamin Weil, 'Conservation, Exploitation and Cultural Change in the Indian Forest Service, 1875–1927' *Environmental History* 11, 2 (2006): 319–343, pp. 322–4.

⁴³ See, for instance, on this point, James Winter, *Secure from Rash Assault: Sustaining the Victorian Environment* (Berkeley: University of California Press, 1999); Brian Clapp, *An Environmental History of Britain since the Industrial Revolution* (London: Longman, 1994). See also, Michael Havinden and David Meredith, *Colonialism and Development: Britain and its Tropical Colonies, 1850–1960* (London: Routledge, 1993).

⁴⁴ *Modernizing Nature*, pp. 121–5. The impact of the Boer War and then the two world wars on both technological changes in forestry, energy use, and intensified demands on forest materials, notably timber, cannot be underestimated. A useful consideration of some these factors, and more generally the impact of war on natural resources management or exploitation can be found in Richard Tucker and Edmund Russell (eds.), *Natural Enemy, Natural Ally: Toward an Environmental History of War* (Corvallis: Oregon State University Press, 2004).

⁴⁵ A recent sustained examination of the circulation of scientists, their, ideas, and the production of new technical knowledge in the circuits of empire prior to the twentieth century may be found in Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia, 1650–1900* (London: Palgrave Macmillan, 2006).

⁴⁶ David Gilmartin, 'Scientific Empire and Imperial Science: Colonialism and Irrigation Technology in the Indus Basin', *Journal of Asian Studies* 53, 4 (1994): 1127–49, doi: 10.2307/2059236.

⁴⁷ See, for a discussion in Indian context, chapter three in Sivaramakrishnan, *Modern Forests*; or in more philosophical terms, Worster, *Nature's Economy*.

⁴⁸ Grove, *Green Imperialism*; Arnold, *Science, Technology and Medicine in Colonial India*.

⁴⁹ For a neat complication of the Arcadian-imperialist divide and the emphasis on what purchase empire provided to the development of certain 'improving sciences' see *Empire Forestry*, pp. 21–6.

⁵⁰ Barton, *Empire Forestry*, p. 7. See also Thomas Richards, *The Imperial Archive: Knowledge and the Fantasy of Empire* (London: Verso, 1993).

⁵¹ Weil, 'Conservation, Exploitation and Cultural Change in the Indian Forest Service', pp. 333–6.

⁵² Barton, *Empire Forestry*, p. 33. Revising Richard Grove's adulatory account of Hugh Cleghorn as a moving spirit of modern environmentalism, a recent essay on this founding figure of colonial forestry in India notes that Cleghorn repeatedly highlighted the commercial value of forests in his recommendations for government control over them. See Pallavi Das, 'Hugh Cleghorn and Forest Conservancy in India', *Environment and History* 11, 1 (2005): 55–82, pp. 61–72, doi: 10.3197/0967340053306149.

⁵³ See Sivaramakrishnan, *Modern Forests*. See also Eugene Cittadino *Nature as the Laboratory: Darwinian Plant Ecology in the German Empire, 1880–1900* (Cambridge: Cambridge University Press, 1990).

⁵⁴ E.P. Stebbing, *The Forests of West Africa and the Sahara: A Study of Modern Conditions* (London: W & R. Chambers, 1937).

⁵⁵ D.E. Hutchins, *A Discussion of Australian Forestry* (Perth: F.W. Simpson, 1916); Idem, *Waipoua Kauri Forest, its Demarcation and Management* (Wellington: Government Press, 1918), p. 189.

⁵⁶ *Empire Forestry*, pp. 95–129.

⁵⁷ *Modernizing Nature*, p. 16.

⁵⁸ David Ludden, 'India's Development Regime' in Nicholas Dirks (ed.), *Colonialism and Culture* (Ann Arbor: University of Michigan Press, 1992).

⁵⁹ John McNeill, *Something New Under the Sun: An Environmental History of the Twentieth-Century World* (New York: W.W. Norton, 2000), p. 320.

⁶⁰ *Nature's Government*, p. 33.

⁶¹ *Nature's Government*, pp. 59–72.

⁶² *Nature's Government*, p. 80.

⁶³ *Nature's Government*, p. 237. See also, Cederlof and Sivaramakrishnan, *Ecological Nationalisms*.

⁶⁴ *Nature's Government*, p. 268.

⁶⁵ *Imperial Ecology*, p. 4.

⁶⁶ *Imperial Ecology*, pp. 42–75.

⁶⁷ See Arthur Tansley, *The British Islands and their Vegetation* (Cambridge: Cambridge University Press, 1939).

⁶⁸ *Imperial Ecology*, pp. 222–7.

⁶⁹ Arthur Tansley, *Our Heritage of Wild Nature: A Plea for Organized Nature Conservation* (Cambridge: Cambridge University Press, 1945).

⁷⁰ This point is made effectively for Southeast Asia by Peter Vandergeest and Nancy Peluso, 'Empires of Forestry, Part 1'.

⁷¹ Ledzion, *Forest Families*, pp. 1–14. In 1931, Donald Currie was in South Coimbatore Division and he camped in an area that had rarely been visited, to find teak was being overexploited, and so nurseries were organised. He discovered replanted seedlings left in the nursery for additional two years grew rapidly, up to six feet, and these could then be planted into forest gaps without fear of suppression by weeds or browsing. See Ledzion, *Forest Families*, p. 45. Such innovation was the stuff of successful forestry in the age of high continental science!

⁷² I use affective knowledge here in the sense given to the term by Bayly, who says, 'knowledge derived from the creation of moral communities within the colonial society by means of conversion, acculturation, or interbreeding'. See Bayly, *Empire and Information*, p. 7.

⁷³ Weil, 'Conservation, Exploitation and Cultural Change in the Indian Forest Service, 1875–1927', pp. 322–23.

⁷⁴ Like others before him, Robin Drummond, a forester who served in north India, in regions of which Agrawal writes in *Environmentality*, described the abundant game and

fowl that were shot both for the daily meal in camp or HQ and the shooting parties that Indian foresters arranged for friends and visiting dignitaries. Tigers and panthers, bears, deer and snakes were plentiful in the 1920s and 1930s when many of these officers served. In their memoirs many of these foresters also wrote about protecting tribal villagers from moneylenders, providing them with schools, roads and medical assistance. These foresters were engaging, in short, in patriarchal modes of development and intimate government well into the mid-twentieth century. See Ledzion, *Forest Families*, p. 107.

⁷⁵ Weil, 'Conservation, Exploitation and Cultural Change in the Indian Forest Service, 1875–1927', p. 328.

⁷⁶ Botanising and hunting were two forms of colonial knowledge production with relevance to the forest or the agrarian landscape that were more likely to generate affective knowledge about the forest ... though the former was conducted with the intimate routines familiar to natural history but towards the formalist ends of classification and ultimately sequestering plant resources. My use of the term 'forms of colonial knowledge' is inspired by Bernard S. Cohn, *Colonialism and its Forms of Knowledge: The British in India* (Princeton: Princeton University Press, 1996).

⁷⁷ *Environmentality*, p. 9.

⁷⁸ The argument, then, does run somewhat counter to that of Rajan's *Modernizing Nature*, which claims continental forestry was hegemonic and all these foresters reproduced German and French forestry in their practices in India.

⁷⁹ *Environmentality*, pp. 29–30.

⁸⁰ I refer here to Rangarajan, *Fencing the Forest*, Saberwal, *Pastoral Politics*, Sivaramakrishnan, *Modern Forests*, and Vandergeest and Peluso, 'Empires of Forestry'.

⁸¹ *Environmentality*, pp. 59–61.

⁸² *Environmentality*, pp. 85–6.

⁸³ *Environmentality*, pp. 104–19.

⁸⁴ *Environmentality*, pp. 152–3.

⁸⁵ *Environmentality*, p. 172.

⁸⁶ Judith Butler, *The Psychic Life of Power: Theories in Subjection* (Stanford: Stanford University Press, 1997).

⁸⁷ Sugata Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire* (Cambridge, MA: Harvard University Press, 2006).

⁸⁸ John F. Richards, *The Unending Frontier: An Environmental History of the Early Modern World* (Berkeley: University of California Press, 2003).

