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Worlds Apart? The Scottish Forestry Tradition and the Development of Forestry in India[1]

Jan Oosthoek

It has been suggested that from the late eighteenth century Scottish botanists and scientists helped to transmit climatic, botanical and forestry ideas to India.[2] Many of these botanists were in the colonial service and had observed at first hand the combined impact of imperial and indigenous overexploitation on tropical forests. They believed that there was a direct relationship between deforestation, climatic change and environmental degradation.[3] Alarmed by these real or perceived environmental problems, the colonial government of British India established the Indian Forest Department in 1864. As there was limited scientific forestry training available in Britain or its Empire, and little or no experience of running a centralised forestry service, British authorities in India sought out German foresters, many of whom had been formally trained in Prussia or other German states, to occupy senior positions in the new organisation.

In the early days of the Indian Forest Department, officials were recruited from the ranks of botanists and surgeons, some of whom were new arrivals in India while others had previously worked for the East India Company. Many of these men had been trained in medicine or botany at Scottish universities, in particular the Universities of Edinburgh and Aberdeen. These men brought a unique expertise to India, combining a firm grounding in the study of botany with a methodological approach derived from their medical backgrounds. Understanding how these Scots botanists worked alongside

[1] I would like to thank those who participated in the 'Irish and Scottish Migration and Settlement: Environmental Frontiers' conference, hosted by the AHRC Centre for Irish and Scottish Studies at the University of Aberdeen on 21 June 2008, for their helpful comments on an earlier version of this paper. I am also grateful to Professor Richard Rodger of Edinburgh University and the editors of the JISS for commenting on drafts of this paper.

[2] Richard H. Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860* (Cambridge, 1995), 312, 347; John M. MacKenzie, 'Empire and National Identities: The Case of Scotland', *Transactions of the Royal Historical Society*, 6th series, 8 (1998), 223.

[3] Richard H. Grove, *Ecology, Climate and Empire: Colonialism and Global Environmental History* (Cambridge, 1997), 5–6, 11–20.

foresters trained on the continent to initiate and shape forest conservation in India is crucial if we are to understand the development of forestry services not only in India, but also in Britain and other parts of the world. This paper therefore examines the various European forestry traditions in more detail, considering how they merged in the Indian colonial context and exploring, in particular, the specific contributions made by Scottish-trained botanists and foresters.

I The Continental Forestry Tradition

When the Indian Forest Department was established in 1864, British officials possessed little knowledge of continental scientific forestry. Determined to organise along the same lines as forestry departments in Germany, they therefore appointed German forester Dietrich Brandis as the first Inspector-General of Forests to the Government of India. Brandis, in turn, recruited forestry officers from Germany to fill posts in the upper echelons of the Indian Forest Service. Among the appointees were William Schlich and Berthold Ribbentrop, who were later to follow in Brandis' footsteps as Inspector-General of Forests in 1883–8 and 1888–1900 respectively.[4] These two Germans were preferred for high office over local British forestry officers because of 'the thorough professional training which [they] had received in their own country.'[5] A cadre of forest officers trained in Germany and France was swiftly recruited to fill the ranks of the newly-established Forest Service, leading to the creation of a forestry system in British India which was in the first instance based on continental models of forest management.[6]

[4] Schlich studied forestry at the University of Giessen in Germany. After graduating in 1862, he worked for the Hesse state forestry service before being appointed to the Indian Forest Service in 1867. Ribbentrop was educated at the forest schools in Eisenach and Aschaffenburg prior to his appointment as Special Assistant Conservator of Forests in the Punjab in 1867. See R.S. Troup and Andrew Grout, 'Schlich, Sir William Philipp Daniel (1840–1925)', *Oxford Dictionary of National Biography*, http://www.oxforddnb.com/view/article/35970, accessed 11 November 2009; and Ulrike Kirchberger, 'German Scientists in the Indian Forest Service: A German Contribution to the Raj?', *The Journal of Imperial and Commonwealth History*, 29 (2001), 2.

[5] Dietrich Brandis, 'The Proposed School of Forestry', *Transactions of the Royal Scottish Arboricultural Society*, 12 (1890), 73.

[6] S. Ravi Rajan, *Modernizing Nature: Forestry and Imperial Eco-Development 1800–1950* (Oxford, 2006), 11.

As an economic system, modern forestry emerged in eighteenth-century Prussia. It consolidated earlier practices of traditional woodland management and adopted a more scientific resource management regime. By the early nineteenth century, German forestry had developed into a systematic science of measuring, predicting and controlling the growth of forests and the production of wood mass in order to secure resources for the future and extract a maximum sustainable yield (*Nachhaltigkeit*) and profit. The German forestry tradition was a centralised scientific enterprise based on statistical models of tree growth and the creation of single-species, even-aged forest plantations.[7]

The second important continental influence on forestry in India was the French forestry tradition. Forestry in France was centralised by the government as early as 1669 with the introduction of the Forest Ordinance. After the revolution of 1789, the state confiscated large areas of forested land and by the early nineteenth century it controlled the majority of forests in France. For strategic and economic reasons, anxiety over wood shortages led to the creation of the *Ecole nationale forestière* at Nancy in Southern France in 1824. This school educated a cohort of professional foresters, among them Dietrich Brandis, who were trained in a forestry tradition that was a cross between French and German forest management traditions.[8] Between 1867 and 1893, eighty-one British foresters were trained at Nancy in preparation for their service in India.[9]

The French forestry tradition, although scientific and heavily influenced by German forestry practice, left room for traditional forms of forest management. Due to economic and political pressures, French forestry was characterised by a more flexible approach with attention being given to broadleaves, coppices and mixed stands, as well as to the natural regeneration of forests and traditional user rights. At the same time, even-aged forest plantations managed on scientific principles were also established in France and its colonies and exported to British colonial possessions through foresters who had been trained at the French forestry schools.[10]

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[7] Rajan, *Modernizing Nature*, 36–43; Orazio Ciancio and Susanna Nocentini, 'The Forest and Man: The Evolution of Forestry Thought from Modern Humanism to the Culture of Complexity. Systemic Silviculture and Management on Natural Bases' in Orazio Ciancio (ed.), *The Forest and Man* (Florence, 1997), 42–3.

[8] Rajan, *Modernizing Nature*, 46–7.

[9] Diana K. Davis, *Resurrecting the Granary of Rome: Environmental History and French Colonial Expansion in North Africa* (Athens, OH, 2007), 215–6.

[10] Ciancio and Nocentini, 'The Forest and Man', 43–6; Gregory A. Barton, *Empire*

II The Scottish Forestry Tradition

Scotland had been at the centre of forestry in Britain since at least the seventeenth century. While German forestry followed the example of late eighteenth-century Prussia in favouring state intervention at the expense of the independent, privately-owned estate, in Scotland the opposite happened and from the seventeenth century landowners started to experiment with new modes of forestry, without any form of centralised state intervention. From the early 1600s, tree planting on Scottish estates increased steadily, while 'improving' Scottish landowners began to introduce tree species from continental Europe such as sycamore maple, Norway spruce, larch and European silver fir, none of which were native to Scotland.[11] The availability of considerable 'wastelands' in the Scottish Highlands facilitated these experiments with new species and planting methods.[12]

Scottish landowners were interested in using the forest resources on their estates more efficiently to increase revenue. This went hand in hand with the ideal of aesthetically improving their estates and of securing a sustainable yield to support future generations. This latter aspect shared similarities with the German ideal of *Nachhaltigkeit*.[13] The difference with the German mode of thinking was that the Scottish ideal combined both aesthetic and profit-driven elements to create a kind of early multiple-use forest resource.[14] Furthermore, the traditional woodland management system of coppicing was maintained in tandem with the new forestry plantations, catering to the needs of a wide range of traditional users, while preserving game and aesthetic values.[15]

John Murray, the fourth duke of Atholl, who was nicknamed 'Planter John', embraced this perspective when he wrote that forestry operations should be carried out for 'beauty, effect and profit'.[16] The efforts of John Murray and other plantation schemes in Scotland during the eighteenth century were the

Forestry and the Origins of Environmentalism (Cambridge, 2002), 12–5.

[11] Syd House and Christopher Dingwall, 'A Nation of Planters: Introducing the New Trees, 1650–1900' in T.C. Smout (ed.), *People and Woods in Scotland: A History* (Edinburgh, 2003), 131–2.

[12] Rajan, *Modernizing Nature*, 111.

[13] Ibid., 41.

[14] Multiple-use forestry became fashionable among forestry services in the western world during the 1950s and 1960s with the rise of the automobile and increasing numbers of visitors to the forests. This type of forestry aimed at combining recreational use and nature conservation with wood production.

[15] Rajan, *Modernizing Nature*, 110.

[16] Quoted in House and Dingwall, 'A Nation of Planters', 135.

first attempts anywhere to establish major plantations of conifer trees *ab initio*, as opposed to the conversion of natural forests or coppices that took place in continental Europe.[17] The most notable of these forest plantations emerged in Argyll, in Perthshire and on the Moray coast in the North East of Scotland. The earls of Moray and Fife and the dukes of Atholl and Argyll planted millions of trees to 'improve' their landholdings, and by the last quarter of the eighteenth century smaller landowners had begun to imitate their grander neighbours. The emergence of forestry plantations as a core aspect of Scottish estate management was associated with patriotism and good taste, as well as with making better and more profitable use of the land. By the end of the eighteenth century, tree planting was regarded as a respectable and progressive activity, and a shared vision of what constituted appropriate forest management was widely accepted throughout Scotland.[18]

Much of the knowledge acquired on the Scottish estates from these early experiments and planting activities was disseminated through the learned societies in Edinburgh, such as the Botanical Society of Scotland, as well as through botany and other courses at the university. Particularly important in the spread of modern forest management practice was the creation of the Physic Garden in Edinburgh in 1670, which is now known as the Royal Botanic Garden. In 1723 the Honourable Society of Improvers in the Knowledge of Agriculture in Scotland was established by a group of influential landowners whose aim was to improve the management of the land, including forestry.[19]

Encouraged by these developments, Scottish seed collectors – of whom David Douglas is the most famous – introduced many North American tree species to Europe. In the late 1820s Douglas introduced the Douglas fir and Sitka spruce, trees that were to form the backbone of Scottish forestry during the twentieth century. After Douglas' untimely death in 1834, other Scottish seed collectors continued to introduce new species such as the lodgepole pine, western hemlock and western red cedar. Scottish landowners, driven by the desire to improve their plantations for both profit and pleasure, enthusiastically embraced these trees.[20] This formed an effective breeding

[17] Ibid., 139–40.

[18] Judith Tsouvalis and Charles Watkins, 'Imagining and Creating Forests in Britain, 1890–1939' in Mauro Agnoletti and Steven Anderson (eds), *Forest History: International Studies on Socioeconomic and Forest Ecosystem Change* (Wallingford, 2000), 374–5.

[19] House and Dingwall, 'A Nation of Planters', 138. These landowners included the duke of Atholl and the earl of Breadalbane.

[20] Ibid., 150. The Douglas firs of Craigvinean Forest near Dunkeld are a testament to the planting experiments by Scottish landowners. Planted by the duke of Atholl in 1860,

ground for practical foresters whose experience was further disseminated through the publications of learned societies and other outlets.[21]

A book written by James Brown, a professional forester on the Arniston estate in Midlothian, was of particular importance. Published in 1847, *The Forester* provided practical advice on how to create and manage a forest in the Scottish landscape based on scientific principles. It became a popular and influential work that marked the rise in status of estate foresters in Scotland.[22] James Brown also served as the first president of the Scottish Arboricultural Society, which was established in 1854 by a group of landowners and foresters who were determined to 'place Scottish forestry on a sounder basis as an important section of rural industry.'[23] The formation of the new society signalled the emergence of a body of professional estate foresters in Scotland, from which the Indian Forest Service was to draw so many of the forest officers who ultimately populated its middle and higher echelons. These men brought with them a forestry tradition that was decentralised, open to experimentation, and which combined aesthetic planting and game management with commercial timber production.

III Fusion of Traditions

Before the creation of the Indian Forest Department, forestry regulation and legislation in India had been implemented in an ad hoc and piecemeal fashion. The East India Company had tried unsuccessfully to control the production and trade of timber around the turn of the nineteenth century. This left the British with little choice but to rely on the local timber market to meet their needs and by the late 1820s any attempt to regulate the trade had been abandoned. It was this private trade which led to the over exploitation of certain forest areas in India, generating fears that there would be negative environmental impacts such as soil erosion, climate change and water shortages.[24]

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they are now among the tallest Douglas firs in the world.

[21] Mark Louden Anderson, *A History of Scottish Forestry* (2 vols, London and Edinburgh, 1967), II, 308–12.

[22] House and Dingwall, 'A Nation of Planters', 155.

[23] Anderson, *A History of Scottish Forestry*, II, 120, 314. The quotation is from Malcolm Dunn, 'Forestry in Scotland in the Reign of Her Most Gracious Majesty Queen Victoria', *Transactions of the Royal Scottish Aboricultural Society*, 15 (1898), 129.

[24] Michael Mann, 'Timber Trade on the Malabar Coast, c.1780–1840', *Environment and*

Alarmed by these developments, in 1850 the British Association meeting in Edinburgh set up a committee to study forest destruction and its impacts at the behest of Hugh Cleghorn, a medical doctor working in India. A year later the committee presented its report, which was based on the testimonies of forest administrators in India who were worried about the potential long-term environmental effects of deforestation caused by indiscriminate logging. The committee advised the colonial authorities in British India to introduce tighter controls over the forests, but stopped short of proposing the creation of a central forestry authority.[25] It was in this context that Lord Dalhousie, the Governor-General of India, issued a memorandum of the Government of India on forestry in 1855, later dubbed the 'Charter of Indian Forestry'. This memorandum was based on reports submitted by John McClelland, who was Superintendent of Forests in Burma, and formed the basis for the Forest Act of 1865.[26]

The management of forests in India proved challenging for European foresters coming from the scientific forestry tradition developed in Germany and France. This tradition was reductionist in nature and did not take account of varying environmental and social conditions, leading continental foresters to believe that a direct transfer of forestry practice from the temperate zone to tropical forests would not be too problematic. It soon became apparent, however, that the significantly different and highly variable environmental conditions to be found in India required the development of new forest management regimes.[27] An infusion of Scottish knowledge and experience was to assist in their development.

During the nineteenth century Scotland lacked the capacity to absorb its well-educated workforce, a large number of whom found employment in Britain's expanding colonial services. That Scots occupied many senior professional

History, 7 (2001), 403–25.

[25] Hugh Cleghorn et al., 'Report of the Committee Appointed by the British Association to Consider the Probable Effects in an Economical and Physical Point of View of the Destruction of Tropical Forests', *Report of the Twenty-First Meeting of the British Association for the Advancement of Science* (London, 1852), 78–102.

[26] Barton, *Empire Forestry*, 57.

[27] Marlene Buchy, 'Forestry: From a Colonial Discipline to a Modern Vision', Keynote Paper, Workshop on Changing Learning and Education in Forestry, Sapa, Vietnam, 16–19 April 2000, http://www.mekonginfo.org/mrc_en/doclib.nsf/0/8223AC38A3BA7C6347256A0E002C9035/$FILE/FULLTEXT.html, accessed 18 November 2009; William Somerville, 'Influences Affecting British Forestry. Inaugural Lecture in the Course of Forestry, Edinburgh University, 23 October 1889', *Transactions of the Royal Scottish Arboricultural Society*, 12 (1890), 406.

positions as engineers and doctors is well known, but their importance as foresters is much less widely appreciated. Indeed, just as the Scots dominated the operational, scientific and technological aspects of British activity in India, forestry was no exception.[28] In the preface to the Indian section of the catalogue for the 1884 International Forestry Exhibition in Edinburgh, Sir George Birdwood, a senior administrator in India, gave Scottish botanists the credit for 'having first called attention to the necessity for forest conservation in India'.[29] As mentioned earlier, many officers in the early Indian Forest Service were Scottish-trained surgeons and botanists who had been recruited from other parts of the colonial service.[30] During their education in Scotland they had been exposed to the Scottish Enlightenment traditions that connected medicine with knowledge about botany, climate and geology. This led them to adopt a holistic approach that advocated rigorous field observations and flexible tree-planting programmes that took into consideration local variations in soils, climate and vegetation. Colonial authorities drew upon the expertise of these naturalist surgeons to gain knowledge about India's natural and agricultural resources. Hugh Cleghorn, who held one of the top positions in the early Indian Forest Service, was a prime example of such a surgeon turned botanist, having originally been appointed to the Indian Medical Service.[31] Cleghorn and other Scottish-trained surgeons were likely to have been familiar with estate forestry practices in Scotland. The Indian colonial authorities, like their counterparts in Australia, also drew more directly on the experience of estate forestry in Scotland by recruiting foresters who had been trained on Scottish estates.[32]

Middle and higher ranking officers recruited for the Indian Forest Service had to pass a competitive exam in order to be admitted to the forester training programme. Early recruits were sent to forestry schools in Germany and France, but after 1871 considerations of cost and convenience resulted

[28] Kapil Raj, 'Colonial Encounters and the Forging of New Knowledge and National Identities: Great Britain and India, 1760–1850', *Osiris*, 2nd series, 15 (2000), 124–5.

[29] 'The International Forestry Exhibition', *The Scotsman*, 7 July 1884, 5.

[30] See Richard H. Grove, 'Scottish Missionaries, Evangelical Discourses and the Origins of Conservation Thinking in Southern Africa, 1820–1900', *Journal of Southern African Studies*, 15 (1989), 163–87.

[31] For an in-depth discussion of Hugh Cleghorn and Scottish-trained foresters, see Pallavi Das, 'Hugh Cleghorn and Forest Conservancy in India', *Environment and History*, 11 (2005), 55–82.

[32] John Dargavel, 'Forestry' in idem (ed.), *Australia and New Zealand Forest Histories: Short Overviews* (Kingston, 2005), 27.

in all instruction being concentrated in France.[33] In addition, forestry recruits were also required to train for several weeks under the supervision of an approved forester on a Scottish estate before they were sent out to India.[34] It must be noted that after the introduction of the competitive exam in 1855, the number of Oxbridge graduates in the ranks of the Indian Civil Service rose quickly and that this lessened the dominance of Scotsmen in the Forest Service.[35] Nevertheless, the fact that forestry recruits were trained in both France and Scotland ensured that the ideas and principles of continental forestry were unquestionably inter-mixed with those of Scottish forest management.

The blending together of continental and Scottish forestry management regimes, as well as adaptation to Indian environmental conditions, led to the creation of a distinctive Indian branch of scientific forestry. While rendering the forests profitable remained the primary goal, the conservation of existing forests was also undertaken in order to counter negative environmental effects such as desiccation, flooding and soil erosion. In addition, it was observed that forestry knowledge had to be applied to 'entirely new conditions of climate, and deal with trees and plants not known [in Scotland]'.[36] The limited numbers of commercially useful trees in Indian forests was a particular concern, with teak trees, for instance, making up only about 10 per cent of the so-called teak forests. The diversity and mixed nature of the Indian forests therefore required a management regime that favoured 'valuable commercial species' while 'eliminating the less valuable and those interfering with the growth of the former.'[37] The variety and density of Indian forests, as well as their extensiveness, also encouraged the use of natural regeneration. Berthold Ribbentrop concluded that the 'average cash revenue per acre [was] too insignificant' to justify clearance of the jungle and the creation of plantations.[38] The creation of forestry plantations was therefore less important than in Europe, although a considerable number of

[33] F. Bailey, 'The Indian Forest School', *Transactions of the Royal Scottish Arboricultural Society*, 11 (1887), 155–6. It should be noted that individuals such as Hugh Cleghorn never worked on Scottish estates, nor were they sent to forestry schools. Only new recruits after the establishment of the Forest Service followed this route.

[34] 'Advertisement for Recruitment of Officers in the Indian Forest Service', *The Scotsman*, 15 November 1869.

[35] C.J. Dewey, 'The Education of a Ruling Caste: The Indian Civil Service in the Era of Competitive Examination', *The English Historical Review*, 88 (1973), 276.

[36] 'India As a Field For Our Educated Youth', *The Scotsman*, 11 December 1869, 7.

[37] E.P. Stebbing, *The Forests of India* (2 vols, London, 1922), II, 578.

[38] Berthold Ribbentrop, *Forestry in British India* (Calcutta, 1900), 166.

teak plantations, especially in Burma, were created in places where no forests had previously existed.[39]

The adaptation of German and French models of scientific forestry to the Indian environment was aided by the Scottish experience of decentralised estate forestry. The introduction of exotic tree species in the variable and often extreme environmental conditions of the Scottish Highlands and Islands had led Scottish foresters to develop an experimental approach to forestry, with a strong emphasis on observation. This resulted in an adjustment of planting and management practices in order to encourage these newly-introduced trees to grow in different environments. To some extent they found a similar situation in the varied environments of the Indian subcontinent, ranging from tropical to semi-arid to alpine, though on a very much greater and more complex scale.

The success of the fusion of continental forestry and Scottish practice in India was recognised at the time. In 1891 it was noted in *The Scotsman* that 'Scottish ideas and Prussian experience have combined to produce [successful forestry] in India.'[40] The decentralised model of Scottish estate forestry was to some extent replicated in India, and applied on the much larger scale of the provincial forestry districts which were essentially run as large estates.[41] It was at this regional level that Scottish estate and Enlightenment forestry merged with continental European and local traditions to form hybrid practices that were continually and creatively adapted to the varied political, economic and ecological circumstances of different locales in India.[42] Thus, while India differed from Scotland and the rest of the United Kingdom in having a central forestry policy by 1865,[43] this did not prevent the development of local forest management practices because the policy provided general guidelines rather than prescribing how individual forests or districts were to be managed.

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[39] Sir Richard Temple, 'Lecture on the Forests of India', *Transactions of the Scottish Arboricultural Society*, 10 (1881), 15; Indra Munshi Saldanha, 'Colonialism and Professionalism: A German Forester in India', *Environment and History*, 2 (1996), 204.

[40] 'The Indian Forest Service and its Founders', *The Scotsman*, 17 August 1891, 8.

[41] 'Forestry Districts' or 'Forest Circles' were formed in each province in British India and each was run by a Conservator of Forests. For further details see R.S. Troup, *The Work of the Forest Department in India* (Calcutta, 1917), 9.

[42] On the development of hybrid forestry models in the colonial empires of Asia, see Peter Vandergeest and Nancy Lee Peluso, 'Empires of Forestry: Professional Forestry and State Power in Southeast Asia, Part 2', *Environment and History,* 12 (2006), 359–93.

[43] Scotland and the rest of the United Kingdom would have to wait until 1919 for the creation of a central forestry service.

IV Influence of Returning Foresters

Following their service in India, many of the botanists and foresters who created these hybrid forestry practices returned to Scotland. Sharing the desire of other Scottish foresters, as well as Scottish landowners, to make better use of the country's forest resources, these individuals lent their voices to growing calls for universities to establish lectureships and forestry courses for the education of professional, scientifically-trained foresters who would help to increase the revenue from estates in Scotland. The Scottish Arboricultural Society did its part by inviting prominent Indian forestry officials to give talks about forestry practice, policy and education on the Indian subcontinent. Invitees included Dietrich Brandis and Hugh Cleghorn as well as Colonel Frederick Bailey, the first director of the Indian Forestry School in Dehra Dun. In their talks, these individuals championed the creation of forestry schools in Scotland and England and even the creation of a central forestry service for Britain.[44] The return to Scotland of lesser-known foresters who had served in India likewise contributed to the dissemination of the new ideas of scientific forestry. In 1910, A.C. Forbes, Chief Forestry Inspector to the Department of Agriculture for Ireland, described this process in his book *The Development of British Forestry*:

> Since about 1860, when Cleghorn and Brandis inaugurated the Indian Forest Service, a small stream of continental trained youths has been going out to India, and an equally small stream of retired Indian foresters, on furlough or pension, has been returning from it. Whatever the exact practical results of this intermixture of British and Anglo-Indian ideas may have been, there is little doubt that fresh ideas were instilled into British foresters and proprietors, and a wider knowledge of forestry as an industry instead of a hobby resulted.[45]

The calls for formal forestry education in Scotland were successful and by the late nineteenth century a forestry degree had been established at the University of Edinburgh with a curriculum that included the measuring

[44] See, for example, Hugh Cleghorn, 'Address Delivered at the Twenty-First Annual Meeting', *Transactions of the Royal Scottish Arboricultural Society,* 7 (1875), 199–210; Frederick Bailey, 'The Indian Forest School', *Transactions of the Royal Scottish Arboricultural Society*, 11 (1887), 155–64; Dietrich Brandis, 'The Proposed School of Forestry', 65–77.

[45] A.C. Forbes, *The Development of British Forestry* (London, 1910), 252.

and valuation of woods, forest utilisation and forest policy, silviculture, pathology and zoology.[46] Courses were often taught by foresters with a colonial background, such as the aforementioned Colonel Frederick Bailey, who occupied the first chair in forestry at Edinburgh after his return from India in 1906. In 1892 a special course for forest workers was established at the city's Royal Botanic Gardens. In the years that followed, the three Scottish Agricultural Colleges in Glasgow, Edinburgh and Aberdeen introduced both evening and day courses in forestry. These courses ceased when the Scottish Education Department stopped funding them in 1918 in anticipation of the Forestry Act of 1919, which established the British Forestry Commission and conferred it with responsibility for educating forest workers below university level throughout the United Kingdom.[47]

Although the continental and Indian models of a central forestry service had been around for a long time, the government in London had previously deemed it unnecessary to establish such a service in Britain because it was believed that the country could rely on a safe timber supply from Scandinavia, Canada and other parts of the Empire. This assumption was undermined by the wood shortages of the First World War and in response the British Forestry Commission was created. The Forestry Commission copied the organisation and many of the practices of the Indian Forest Department without much modification, but failed to retain the flexible practice of matching trees to local physical conditions as practised in India. This was due to pressure to create a standing timber reserve and, as a result, large single-species plantations managed on scientific principles started to appear in the Scottish landscape. Although Forestry Commission foresters wanted to create more diverse forests, they were straight-jacketed by a forest policy that regarded trees as a crop that could be grown as a monoculture, like wheat. The single-minded objective of creating a standing timber reserve makes it difficult to assess the true nature of the forestry re-imported to Scotland from India. We can perhaps conclude that the policies and organisation were copied from India, but that different practices were required to meet the unique political and strategic demands of post-World War I Britain.[48] Nevertheless, more than fifty years after the creation of the

[46] Charles J. Taylor, *Forestry and Natural Resources in the University of Edinburgh: A History* (Edinburgh, 1985), 5.

[47] M.L. Anderson, 'Forestry Education in Scotland, 1854–1953', *Scottish Forestry*, 8 (1954), 118–21.

[48] For a full discussion of this, see Jan Oosthoek, *An Environmental History of State Forestry in Scotland* (Ph.D. thesis, University of Stirling, 2001), chapter 4.

Forest Department in India, centralised scientific forestry had finally made a real breakthrough in Britain.

V Summary and Conclusions

Scientific forestry was first transported to India from continental Europe because of a lack of expertise in the British Empire. It was for this reason that the Indian Forest Service employed German foresters and sent forest officers to be educated in Germany and France. In India itself, the French and German forestry traditions were blended and transformed under local environmental, political and economic pressures. In addition, a third strand of forestry practice contributed to the evolution of colonial forestry in India: namely, the experience of Scottish estate forestry, which had developed since at least the seventeenth century.[49] The adaptation of all three traditions to the diverse environments of the sub-continent ultimately led to the creation of a distinctive Indian branch of scientific forestry.

Scotland played a founding role in modern forestry because of the availability of 'wilderness' for afforestation and the presence of landowners who wanted to 'improve' their privately-owned estates. Scottish Enlightenment traditions in turn encouraged experimentation with plantation forestry and the introduction of exotic tree species, and the combination of these factors created a decentralised and adaptive forestry tradition in Scotland.

The experience of Scottish estate forestry was disseminated through publications and scholarly societies such as the Royal Scottish Arboricultural Society, the Royal Society of Edinburgh and the Botanical Society of Scotland, as well as at the Scottish universities. In addition, British recruits for the Indian Forest Service were trained both on the continent and on Scottish estates before they were sent to India. In the Indian context the Scottish forestry tradition worked as a catalyst to stimulate the adaptation of more rigid continental forestry practices to India's diverse vegetation and environments. In India, colonial forestry practices were being made and remade in multiple sites, influenced not only by the various European models but also by professional foresters' creative accommodations to local political, economic and ecological circumstances.[50] For this reason it is hard to define the nature of the forestry model that was re-imported to Scotland by retired foresters in

[49] See also Rajan, *Modernizing Nature*, 62, 110–1.

[50] See also Vandergeest and Peluso, 'Empires of Forestry', 384.

the late nineteenth century. However, the idea of a centralised forest policy and a central forest authority to carry it out was strongly advocated by the returning foresters. This met with the desire of Scottish landowners to make more efficient use of their forests and to increase revenue from their estates. It also formed the basis for the forestry education system that emerged in Scotland and England in the last decades of the nineteenth century and early years of the twentieth century.[51] With the knowledge and experience of foresters returning from India and other parts of the British Empire, forestry in Scotland had come full circle and this formed the foundation on which the British Forestry Commission was established after the First World War.

University of Edinburgh

[51] The first forest training school in England was established at the Royal Indian Engineering College at Coopers Hill in Surrey in 1885. It was headed by William Schlich, the second Inspector-General of Forests in India. When the College closed in 1905, its forestry branch was transferred to Oxford University.