

PENINSULAR MALAYSIA IN THE CONTEXT OF NATURAL HISTORY AND COLONIAL SCIENCE

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Introduction

Natural history, broadly defined, is the account of nature based upon information acquired through observation, an activity identifiable with all viable communities and societies. Differences that arise in the nature of such activity pertain principally to modes of documenting observations within a broad spectrum, ranging from the 'unscientific' to the 'scientific'. Whereas the oral traditions and everyday practices classed as 'unscientific' stood for the veracity of long-term observation within pre-literate communities, systematic written documentation placed natural history on the path of modern evolutionary science.

This paper explores the origins of natural history in the context of European expansion and British imperialism, focusing on Peninsular Malaysia. Natural history as the basis for trade and commercial agriculture mediated the link between overseas expansion and the development of European scientific thought. By virtue of its strategic location in the moist tropics, Peninsular Malaysia made a significant contribution to natural history and, thus, to colonial science. Colonial exploration, cataloguing and mapping of biota was fundamental to the process of 'territorialization'. Integral to colonial state-making was the mapping and documenting of information on climate, geography and natural resources. By exploring the biota of a largely uncharted territory natural history as a colonial enterprise expanded the boundaries of scientific knowledge.

Geographic exploration by specific government institutions, principally the survey and forest departments, complemented the efforts of amateur naturalists who took advantage of improved infrastructure and security under

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colonial rule. Scientific curiosity, combined with social isolation, augmented the community of amateur naturalists from among European government servants, planters and businessmen. The naturalist was often both an explorer and hunter, observing no clear-cut boundary between sport and scientific collecting.

Natural history in the colonies combined Western methods of investigation with indigenous talents and knowledge through the recruitment, with the help of the local elite, of guides, informants and collectors. The early biological collections—borne of the cooperative effort of Europeans and their indigenous assistants—contributed significantly to advancing metropolitan scientific knowledge. Botanical and zoological collections from insular Southeast Asia were of seminal importance, for example, to the pioneer studies of Charles Darwin and Alfred Russel Wallace.

European scientific explorations, like the colonial enterprise itself, were viewed by the early Malayan nationalists as intrusive and outrageous. European efforts to explore the Gunung Tahan, the highest peak in the Peninsula, became for the emergent Malay nationalist a powerful symbol of the threat posed to nature-centred indigenous wisdom by European systems of technical and scientific knowledge. Ishak Haji Muhammad's satirical novel, *The Prince of Gunung Tahan*, published in 1937/38 in the wake of Malay nationalism, and again at independence (1957), questioned the altruistic ends of colonial scientific exploration, ascribing the motives of its agents to 'hopes of fame, pension and other sugar-coated bribes'.²

Though initially the Peninsula served metropolitan interests, represented largely by the Calcutta and Kew Botanic Gardens and the British Museum in London, by the early twentieth century 'British Malaya' established its own research institutions and programmes. Supported by the twin pillars of official utilitarian investment and amateur enthusiasm, the Peninsula emerged as a flagship of empire for tropical plant exploration, an image grafted onto its international profile after Independence. It served the industrial revolution, no less, through the discovery of some plant products and the innovative commercial production of others.

Natural history in the Peninsula, typical in the colonial tropics, was the outcome of Western and indigenous collaboration. By this process, long traditions of local knowledge fed into the broader stream of evolving metropolitan science, engaging colonizer and colonized at the cutting-edge of science. Yet, by virtue of its place at the forefront of European expansion and association with the colonial production of knowledge, natural history has been marginalized, if not overlooked, in the historiography of post-colonial

² Ishak Haji Muhammad, trans. H. Aveling, *The Prince of Gunong Tahan*, First published in 1937 or 1938 in Jawi, Muar, Johor; Second edition, Singapore, 1957; Third edition romanized, 1973, Petaling Jaya; Singapore: Heinemann, 1980, pp. 40-1.

states. It has been perceived as a discourse of Orientalism³, marrying broader imperial ambition with eccentric private pursuits. Only in recent decades has this cynicism, which endured for over half-a-century, given way to a new engagement with natural history as part and parcel of a strengthening national ethos—an outcome of socio-economic progress and exposure to a wider discourse on the intrinsic value of nature.⁴

Natural History: Origins

Within the Western tradition, systematic observation as a basic tool for scientific deduction was employed by Aristotle (384-322 BCE) for the study of animals.⁵ Perfected by his pupil Theophrastus (c. 371-286 BCE) for understanding both the characteristics and uses of plants, the study of natural history culminated in Dioscorides's (c. 40-80 BCE) *Materia medica* and Pliny's (22/23-79 CE) *Historia naturalis*, paving the way for botany as a science. Patronage as a central feature of the origins of natural history is evident in the relations between Aristotle and Alexander the Great (356-323 BCE), and Pliny and the Roman patriciate. Revived in the Renaissance courts of fifteenth century Italy, patronage for the naturalist as part of the wider humanist elite saw the establishment of natural history as a university discipline, with the appointment in 1543 of Giuseppe Gabrieli (1494-1553) as Professor at the University of Ferrara.⁶

The naturalist, by virtue of his function as collector and curator, was more often than not an agent of the state. Many functioned as court herbalists and physicians and this, and their crucial role in exploring and identifying biological resources for commercial and imperial expansion, extended the reach of their intrinsic role as collectors and curators. The quest for products from exotic lands was a driving force behind the early voyages of discovery. Alexander the Great's armies returning from the Indus provided the earliest Greek accounts of mangroves, rice and jackfruit.⁷

³ U. Kirchberger, 'German scientists in the Indian Forest service: A German contribution to the Raj?', *Journal of Imperial and Commonwealth History*, 29, 2, 2001, p. 15.

⁴ J. Kathirithamby-Wells, *Nature and Nation: Forests and Development in Peninsular Malaysia*, Copenhagen: Nordic Institute of Asian Studies; Honolulu: University of Hawai'i Press; Singapore: Singapore University Press, 2005, pp. 422-3.

⁵ According to the philosopher Jonathan Barnes, Aristotle 'founded the science of biology, set it in a sure empirical and philosophical basis, and gave it the shape it would retain until the nineteenth century'. For a critical appraisal of this view see M. Davies and J. Kathirithamby, *Greek Insects*, London: Duckworth, 1986, pp. 16-21.

⁶ P. Findlen, 'Courting Nature', in N. J. A. Jardine and E.C. Spray, eds., *Cultures of Natural History*, Cambridge: Cambridge University Press, 1996, pp. 57-74.

⁷ Sir Arthur Holt, *Theophrastus: Enquiry into Plants*, London: William Heinemann, 1916, pp. 313-5, 319; A. Povard, *The Naming of Names*, London: Bloomsbury, 2005, pp. 38-9.

Natural history owes a similar debt to Arab and Chinese travel accounts. The tenth-century geographer Masudi recorded, among other exotics, *Piper cubeba* (*lada berekur*: ‘tailed pepper’), located in Java by Chinese sources.⁸ Compared with Indian and Arab narratives of exotic places and products, Chinese accounts ‘tend to be less theoretical or mythological’, noted K.N. Chaudhuri. *The Illustrated Record of Strange Countries* (c. 1430) for example, accurately recorded the zebra and rhinoceros, probably sighted on one of the Ming Indian Ocean voyages led by Admiral Zheng He (1403-33), which claimed to have touched the east coast of Africa.⁹ The unfamiliar, the spectacular, the sensational and the perilous likewise attracted early European travelers to Asia. The Italian Franciscan Friar Odorico of Pordenon who visited Malabar, Sumatra, Java and Maluku alluded to the ‘most terrible poison of the world’ from *Antiaris toxicaria* (*akar ipuh*).¹⁰

In Quest of Tropical Nature

A succession of early European travellers and explorers in Southeast Asia—Nicolo di Conti (c.1395-c.1469), Duarte Barbosa (d. 1521), Antonio Pigafetta (c.1491-c.1534), Sir Francis Drake (c.1540-96), Jan Huyghen van Linschoten (1563-1611) and William Dampier (c.1651-1715)—recorded and often collected samples, both as curiosities and items of economic value. These included spices, fruits and spectacular plants such as bamboo. Early travellers, beginning with Pigafetta on the Magellan expedition, were likewise struck by the sheer beauty of birds and the curious shapes and habits especially of large mammals such as elephant, tiger and rhinoceros.

The search for economic produce was actively promoted by both the English and Dutch East India Companies as part and parcel of trade and

⁸ Originating in the Malay Archipelago, this variety of pepper, used as a curative, had been exported to Europe since Roman times and, from around 1200 CE, to China. J. U. Lloyd, *History of the Vegetable Drugs of the U.S.P.*: p. 50, <http://www.swsbm.com>. Accessed 14 September 2007; I. H. Burkill, *A Dictionary of the Economic Products of the Malay Peninsula*, First published in 1936; Kuala Lumpur: Government of Malaya and Singapore, 1966, II, p. 1773.

⁹ R. Needham, *Science and Civilization*, Cambridge: Cambridge University Press, 1959, III, p. 513; K. N. Chaudhuri, *Trade and Civilization in the Indian Ocean: An Economic History Since the Rise of Islam*, Cambridge: Cambridge University Press, 1985, p. 60; K. N. Chaudhuri, *Asia Before Europe: Economy and Civilization of the Indian Ocean from the Rise of Islam in 1750*, Cambridge: Cambridge University Press, 1990, p. 125; J. J. L. Duyvendak, *China's Discovery of Africa*, London: Probsthain, 1949; E. Ringmar, ‘Audience for a Giraffe: European Expansionism and the Quest for the Exotic’, *Journal of World History*, 17, 4, 2006, pp. 390-1.

¹⁰ C. G. G. J. van Steenis, ed., *Flora Malesiana: History of Malaysian Phytography*, Jakarta: Noordhoff-Kolft, 1948-9, ser.1, vol. 4², p. lxxiv.

exploration. Immediately after the Dutch VOC (*Vereenigde Oost Indische Compagnie*) received its charter in 1602, its surgeons were instructed to bring home dried specimens of all available plants, fruits and flowers, with information about their vernacular names and uses.¹¹ Apart from imperial and mercantile initiatives, 'gentlemen' of means emerged as avid collectors, reliant on seamen and travellers for specimens, circumventing official efforts to corner scientific information.¹²

Following its capture by the Portuguese in 1511, Melaka lost its pre-eminence as an international spice emporium but sustained its trade in forest produce. Removed from the full enforcement of Batavia's trade restrictions, it played a significant role as a centre for private trade and smuggling.¹³ Forest products, both animal and vegetable, formed an important component of this trade.¹⁴ More than profit, such items, often of scientific value, represented to private traders and collectors a potential means to patronage and fame. William Dampier, a buccaneer and naturalist who explored the Malay Archipelago, made several visits to the Peninsula and Melaka. He returned home with notes, illustrations and herbarium specimens of such quality that he is remembered as a contributor to Malaysian phytography.¹⁵ Melaka's exports well into the nineteenth century included not only plant products but also animals and animal parts, especially ivory and bird skins and feathers.¹⁶ Melaka is also believed to have been the provenance of the

¹¹ Ibid., p. lxxvi.

¹² S. Sangwan, 'Natural history in the colonial context: profit or pursuit? British botanical enterprise in India 1778-1820', in *Science and Empires: Historical Studies about Scientific Development and European Expansion*, eds., P. Petitjean, C. Jami and A. M. Moulin, Dordrecht: Kluwer, 1992, p. 282; D.E. Allen, *The Naturalist in Britain: A Social History*, London: Penguin, 1976, p. 37.

¹³ D. Lewis, 'The Dutch East India Company and the Straits of Malacca, 1700-1784; Trade and Politics in the Eighteenth Century', PhD thesis, ANU, Canberra, 1970, pp. 57-69.

¹⁴ Ibid., 48-9; B. Harrison, 'Trade in the Straits of Malacca in 1875: a memorandum by P.G. de Bruijn, Governor of Malacca,' *Journal of the Malaysian Branch of the Royal Asiatic Society (JMBRAS)*, 26, 1, 1953, pp. 56-62; J. Kathirithsmby-Wells, 'Siak and its changing strategies of survival' in A. Reid, ed., *The Last Stand of Autonomies: Responses to Modernity in the Diverse States of Southeast Asia and Korea, 1750-1900*, London: Macmillan, 1997, pp. 223-4.

¹⁵ W. Dampier, *Voyages and Discoveries*, ed. C. Wilkinson, London: Argonaut Press, 1699, II, pp. 3, 110, 159, 169; Personal communication: Christopher G. Wells; *Flora Malesiana*, 1948-9, ser. 1, vol. 4², p. lxxxix; *Journal of the Linnean Society of London, Botany (Jour. Linn. Soc. Bot.)* 24, [1887], pp. 129-35.

¹⁶ A. R. Wallace, *The Malay Archipelago and the Land of the Orang-Utan and the Bird of Paradise*, First published in 1869, London; New York: Dover, 1962, p. 21.

Argus pheasant specimen that Carl Linné (Linnaeus, 1707-78) used in establishing the identity of his *Phasianus argus* Linn. (*Argusianus argus*).¹⁷

Natural History and National Wealth

Modern European plant science had its roots in medieval *materia medica*, a tradition carried forward by the universities through the creation of physic and, later, botanic gardens, established during the sixteenth and seventeenth centuries in Pisa, Padua, Florence, Bologna, Zurich, Montpellier, Leipzig, Leiden, Oxford, Cambridge, Berlin and Edinburgh. Among other functions, these gardens served, as institutions for training physicians for service in the colonies. The lead role they played in discovering and inventorying plants of medical and pharmaceutical value forged a crucial link between botanic gardens and the quest for products, territory and empire.

Garcia D'Orta (c. 1501/2-68), a Spanish physician who served several viceroys in Goa, established the botanic garden near Bombay to assist in the assemblage and study of endemic plants. His *Aromatum Historia* (1563), compiled with Muslim and Hindu collaborators, has been described as 'a landmark in the history of civilization'.¹⁸ Indigenous knowledge and information as part of a collaborative endeavour in natural history is convincingly illustrated in Hendrik van Rheedé's ground-breaking 12-volume *Hortus Malabaricus* (1678-1703) based on Brahminical Ayurvedic knowledge and the services of Ezhava collectors and tree climbers in the Malabar.¹⁹ The same appreciation of the value of exotics to medical knowledge and colonial agricultural enterprise led the VOC to appoint the naturalist G.E. Rumpf, better known as Rumphius (1627-1702), on its establishment in Ambion. Rumphius, who believed that God in his wisdom had provided appropriate herbs to cure endemic diseases, worked with local physicians to produce the 6-volume *Herbarium Amboinense* (1741-55). These two magisterial studies, made in the absence of any pre-existing model for technical organization, laid the foundation for phytographic studies of

¹⁷ F. N. Chasen, *A Handlist of Malaysian Birds*, Singapore: Government Printing Press, 1935. p. 8; D. R. Wells, *Birds of the Thai Malay Peninsula*, London: Academic Press, 1998, I, p. 22.

¹⁸ A. J. R. Russel-Wood, *The Portuguese Empire, 1415-1808*, Baltimore and London: Johns Hopkins University, 1982, p. 83; *Flora Malesiana*, 1948-9, ser. 1, vol. 4², p. lxxv.

¹⁹ *Flora Malesiana*, 1948-9, ser. 1, vol. 4², p. lxxxiii; R. Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860*, Cambridge: Cambridge University Press, 1995, pp. 84-5, 90.

South and Southeast Asia and established Leiden's pre-eminence in tropical botany.²⁰

The eighteenth-century Enlightenment gave a fillip to scientific endeavour and the culture of cabinet curiosities centred on both the collection and classification of flora and fauna. Natural history commanded a wide spectrum of devotees including wealthy merchants, naturalists-cum-colonial administrators, surgeons and professional collectors commissioned by private men of means or museums and gardens. Most importantly, the rise of scientific empiricism strengthened belief that improved knowledge of the natural world was the key to material progress.

Among the early naturalists of the Enlightenment who co-opted natural history for national good was Linnaeus. A graduate of Harderwijk University, Linnaeus gained familiarity with Holland's herbaria of the Asian tropics. The collection included plant specimens and drawings made by Paulus Hermann in Ceylon during c. 1672-7, regarded 'the first important contribution towards knowledge of the Asian tropics'.²¹ Linnaeus, furthermore, was impressed by the Dutch experimental planting of exotics, including banana, which flowered in Holland for the first time in January 1736.²² Inspired by the Dutch example, he launched on a programme for the acclimatization of foreign plants to the Swedish environment, to promote national self-sufficiency.

Though Linnaeus's experiments failed, the connection he established between natural history and national wealth was widely influential. It struck a cord with Adam Smith (1723-90) and other political economists of the Enlightenment who placed their faith in agricultural improvement, for which the introduction of new plant and animal species was considered crucial.²³ These developments put a premium on naturalists and, after Linnaeus, Sir Comte de Buffon (1707-88), Albrecht Haller (1708-77) and Joseph Banks (1743-1820), all served as agricultural and medical consultants to sovereigns.²⁴ A positive boost to natural history was Linnaeus's historic innovation, the 'binomial system of nomenclature', set out in *Species plantarum* (1753) for flora and *Systema naturae* (1758) for fauna. Together, these works provided a common technical vocabulary that rationalized biological classification and internationalized natural history.

Natural history and the colonial enterprise were mutually supportive. Exploration and the description and inventorying of the constituent parts of nature were co-opted into the imperial adventure, to assert global power and

²⁰ *Flora Malesiana*, 1948-9, ser. 1, vol. 4², pp. lxxxiv-lxxxvi; Grove, *Green Imperialism*, pp. 84-90.

²¹ *Jour. Linn Soc. Bot.* 24, [1887], pp. 129-35.

²² *Flora Malesiana*, 1948-9, ser. 1, vol. 4², lxxxi.

²³ E. Spary, 'Political, Natural and Bodily Economies, in Jardine *et. al.* eds., *Cultures of Natural History*, p. 179.

²⁴ *Ibid.*, p.186.

boost domestic prosperity. Colonialism, at the same time, was given a moral purpose. Inspired by Montesque's *Spirit of the Laws*, the concept of environmental determinism informed Adam Smith's philosophy of the superiority of Western nations, endowed with temperate climes, over the people of the tropics.²⁵ Colonial rule, considered a necessary catalyst for progress towards 'civilization', conflated biogeography and geopolitics. As Charles Lyell (1797-1875) observed, the 'extent of this parcelling out of the globe may be considered as one of the most interesting facts clearly established by the advance of modern science'. The concepts of communities and nations found their parallel in the plant and animal kingdom. The human and natural worlds alike were observed, counted, grouped and described according to their physical characteristics and behaviour.²⁶

Britain and the Natural World of Maritime Southeast Asia

Whereas Sweden's lack of overseas possessions directed Linnaeus's dedication to plant acclimatization that generally failed, Britain's commercial and territorial ambitions overseas conditioned a different path for natural history. The discovery and acquisition of economic plants and products was recognized as the key to trade-generated national wealth and the panacea for poverty and social ills. The person who brokered the link between desire for material wealth and the search for its location and procurement overseas was the indomitable and widely influential Banks, President of the Royal Society (1778-1820) and, from 1773, de facto director of the Royal Botanical Gardens. Also a member of the Privy Council Committee for trade – the organization most directly concerned with augmenting wealth and self-sufficiency—he used his influence with the Royal Institution and the Board of Agriculture to forge a successful link between science and empire.²⁷

Despite the efforts of the Dutch and English Companies to exert a propriety hold on colonial biota and obstruct plant exports, the acquisition and international exchange of plant specimens within scientific circles became the norm. Carolus Clusius who held the Chair of Botany in Leiden (1592-9) reputedly obtained 'Malaysian' specimens from Sir Francis Drake. Again, following the death in 1695 of the VOC botanist, Paulus Hermann, his notes and manuscript for the publication of *Paradisus Batavus* (1698), were

²⁵ D. Arnold, *The Problem of Nature: Environment, Culture and European Expansion*, London: Blackwell, 1996, pp. 21-4.

²⁶ J. Browne, 'Biogeography and Empire' in Jardine *et. al.*, eds., *Cultures of Natural History*, p. 314.

²⁷ J. Gascoigne, *Joseph Banks and the English Enlightenment: Useful Knowledge and Polite Culture*, Cambridge: Cambridge University Press, 1994, pp. 112, 131.

acquired and used by William Sherard (Sherwood), founder of the Chair of Botany in Oxford.²⁸

In 1778, the English East India Company (EIC) appointed J.G. Koenig, a pupil of Linnaeus, as 'Professor of Botany and Natural History' in Madras. Acquainted with the Indian flora through his previous employment as 'state naturalist' by the Nawab of Arcot, Koenig proved well-qualified for the post.²⁹ His appointment, believed to have been initiated by Banks, firmly established colonial science within the purview of imperial economic policy.³⁰ As part of his plant exploration around the Bay of Bengal, Koenig worked in the private gardens of C. de Vendt in Melaka and conducted the earliest and largest botanical survey of the west coast of the Peninsula (1778-9).³¹

It was, however, on the west coast of Sumatra that the EIC conducted some of its earliest botanical experimentation in the tropics. Bengkulen (Bangkulu), which was originally settled in 1685 and where pepper cultivation was extensively researched, was declared a Presidency in 1760 with the express aim of developing its full economic potential. To help fulfil this objective, Philip and Charles Miller, sons of the well-respected gardener at the Chelsea Physick Garden, were engaged as botanists, successively, in 1760 and 1770. Charles Miller was entrusted in 'the greatest secrecy' with the experimental planting of nutmeg and cloves, using seedlings that visiting Bugis traders were encouraged to smuggle from Maluku.³² In addition to breaching the Dutch spice monopoly, the EIC envisaged expanding the range of Benkulen's exports by the introduction of tea, ginger, turmeric and mulberries. To this end, Charles Miller was placed in charge of the ill-fated German settlement at Benkulen.³³ These efforts prefigured experiments in spice cultivation at the Calcutta Botanic Gardens under its successive Superintendents, Robert Kyd (1795-93) and William Roxburgh (1793-1815).

As the EIC's experience in west Sumatra so clearly demonstrated botanical exploration and plant experimentation were indivisibly tied to knowledge both of environment and people. Apart from acquiring information on climate, geography and landscape, bio-geographical

²⁸ *Flora Malesiana*, 1948-9, ser. 1, vol. 4², p. lxxviii.

²⁹ Grove, *Green Imperialism*, p. 364.

³⁰ *Ibid.*, p. 330; Sangwan, 'Natural history in the Colonial Context,' in Petitjean *et. al.*, eds., *Science and Empire*, p. 283.

³¹ *Flora Malesiana*, 1948-9, ser.1, vol. 4² p. ci, 'Journal of a voyage from India to Siam and Malacca in 1779', *Journal of the Straits Branch of the Royal Asiatic Society (JSBRAS)*, 1894, vol. 26, pp. 58-201.

³² J. Bastin, *The British in West Sumatra, 1685-1825*, Kuala Lumpur: University of Malaya Press, 1965, pp. xxxii, 76-7 n. 266.

³³ J. Kathirithamby-Wells, *The British West Sumatran Presidency, 1760-85: Problems of Early Colonial Administration*, Kuala Lumpur: Penerbit Universiti Malaya, 1977, pp. 125-8.

expeditions focused on inventorying the types and distribution of people, plants and animals. Although part and parcel of the colonial initiative, natural history in the tropics was crucially dependent on indigenous collaboration. Co-opting reliable and loyal indigenous guides and informants was critical for exploring unfamiliar territory. Their skills proved indispensable for tracking paths, estimating the length and duration of daily progress, avoiding physical danger, winning the confidence of local people and dealing appropriately with hostility.

Drawn into daily interaction with native informants and other indigenes, the explorer as naturalist witnessed the close interaction between people and their environment. Thus, natural history laid the foundations for ethnography. Both proved integral to the imperial design. During the course of their service in Benkulen, Charles Miller (1770-72) and the surgeon-botanist Charles Campbell (1791-1807) conducted pioneer explorations into the Sumatran hinterland. Expeditions into the Batak region of Tapanuli by Miller in 1772 and Kerinci by Campbell in 1800 were effectively exercises in information gathering about societies adapted to specific environments. Nature and culture were intertwined in Miller's narrative:

I found there [in Kerinci] also a beautiful kind of the *hedychium coronarium*, now ranked among the *kaempferias*. It was of a pale orange, and had a most grateful odour. The girls wear it in their hair, and its beautiful head of lily flowers is used in the silent language of love.³⁴

The task of the surgeon-botanist was effectively multidisciplinary. The reports of Miller and Campbell testify to their acute observation, untiring enthusiasm and detailed recording of every aspect of the country they traversed, including its indigenous laws, customs and peculiar mannerisms.³⁵ Natural history expeditions underwrote investigation into modes of production and trade, social institutions, methods of warfare and the circulation of arms and money, all of which had profound implications for 'territorialization', implicit in the colonial enterprise. Intimate knowledge of the geo-political tribal landscape and an accurate and detailed mapping of population and communication networks were essential guides for resource extraction, treaty-making, delineation of boundaries, understanding of population movements, management of disease and control of wildlife that threatened people and agriculture.

³⁴ William Marsden, *A History of Sumatra*, First published in 1811, London; Kuala Lumpur: Oxford University Press, 1966, p. 307.

³⁵ *Ibid.*, pp. 304-24, 365-95.

The cooption of natural history into colonial enterprise in Sumatra culminated in William Marsden's seminal *History of Sumatra* (1811), based on information accrued during his tenure as secretary in Benkulen (1771-9). Written under the patronage of Banks, the work fulfilled the immediate ends of politics and commerce and addressed broader concerns of imperial science and philosophy. Marsden's book included a description of economic plants, timber trees, and a list of medical herbs, with their uses where known.³⁶ His account of the Sumatrans—based on observations of physical characteristics, manners and customs within specific natural environments—drew from the methodology of natural history.

Marsden's wide-spanning interests placed natural history within the purview of language, culture and history, reflecting an intellectual tradition best represented by his contemporary, William Jones of the Calcutta Supreme Court, polymath and founder of the Asiatic Society of Bengal (1784). These British initiatives may well have been inspired by the inauguration in 1778 of the Batavian Academy of Arts and Sciences (*Batavia Genootschap van Kunsten en Wetenschappen*), a branch of the Dutch Society of the Sciences for the improvement of agriculture, trade and human welfare.³⁷ Marsden, as with Jones, believed the grand objective of society to be the study of Man and Nature.³⁸ Like nature, whose productive capacity could be improved through agricultural endeavour, less advanced societies could be set on the path to progress through enlightened government.

It remained for Sir Stamford Raffles (1781-1826) to give practical expression to contemporary British ambitions for promoting natural history in the Malay-Indonesian region, which received a significant boost from the founding of the commercial bridgeheads at Penang (1786) and Singapore (1819). Strategic staging points for expeditions, both served as provisioning centres and places where influential contacts could be made. Singapore, especially, was popular for the purchase of essential field equipment including preservatives, needles and stationery for making specimens and drawings.

Like Marsden, Raffles articulated the indivisible ties between the natural environment and human affairs in his monumental *History of Java* (1811). Raffles's investigations into plants and timbers of economic value during his service as Governor of Java (1811-16) were matched by his curiosity about animals, such as the orang-utan that he later adopted in

³⁶ Ibid., pp. 97-110.

³⁷ Lian The and P. van der Veur, *The Verhandelingen van het Bataviaasch Genootschap: An Annotated Content Analysis*, Papers in International Studies, Southeast Asia Series, no. 26, Athens: Ohio University Center for International Studies, 1973, p. 3.

³⁸ R. Desmond, *Kew: The History of the Royal Botanic Gardens*, London: Harvill Press / The Royal Botanic Gardens, 1995, p. 52.

Sumatra, and their interaction with humans.³⁹ Both Raffles in Sumatra (1818-23) and William Farquhar as Resident in Melaka (1795-1818) and Singapore (1819-23) maintained zoos, following Governor-General Lord Wellesley's example of the Barrakpore zoo, established in 1804 for the study of natural history. Raffles's interests, which spanned language, culture, botany, zoology and geology, marked him out as the foremost nineteenth-century Orientalist, whose interests spanned the arts and natural history. Though having no formal scientific training, his description of the spectacular *Rafflesia arnoldi* in Sumatra (see below) evinced his keen eye for detail and appreciation of recording data in the best tradition of natural history.⁴⁰ A network of talented botanists, zoologists, native collectors and painters supported his ardent amateur interests. During his sojourn in Melaka, in preparation for the Java expedition (1810-11), he employed no less than four collectors to cover flora, vertebrates, insects and marine life.⁴¹

An important complement to specimen collections was natural history drawings to record images and hues from life. Indian painters found ready employment among naturalists of the East India Company following the disintegration of the Moghul court,⁴² as did Chinese artists from the treaty ports of Canton and Macao. Some of the earliest drawings of Southeast Asian flora and fauna acquired by Governor-General Lord Wellesley (1798-1805) and Lord Clive as Governor of Madras (1798-1803) were made by Chinese artists in Melaka.⁴³ Skilled artists were not short of patrons. Manu Lal from Patna is believed to have accompanied James Parr when he was appointed Resident in Benkulen. The work of the Indian artist was among 202 paintings later presented by Parr to the Company Museum.⁴⁴ Similarly, Marsden and, later, Raffles and Farquhar employed a group of Chinese artists from Macau.⁴⁵ The early paintings and botanical samples sent home by Raffles impressed Banks; but his shipment in 1824 of a reputedly unparalleled Southeast Asian collection, containing some 2000 natural history specimens and cultural artefacts, was lost en route to England in the fire that engulfed the *Fame*.

³⁹ Lady Sophia Raffles, *Memoir of the Life and Public Services of Sir Stamford Raffles*, First published in 1830, London; Introduction by J. Bastin, Singapore: Oxford University Press, 1991, p. 447.

⁴⁰ *Ibid.*, p. 535.

⁴¹ Abdullah bin Abdul Kadir, *The Hikayat Abdullah: An Autobiography of Abdullah bin Kadir (1797-1854)*, trans. & anno. A.H. Hill, First published in 1969, Singapore, 1969; Singapore: Oxford University Press, 1985, p. 76.

⁴² M. Archer, *Natural History Drawings in the India Office Library*, London: Her Majesty's Stationery Office (HMSO), 1962, pp. 55-7.

⁴³ *Ibid.*, pp. 7, 8, 59-61, 77, 92-3.

⁴⁴ *Ibid.*, 19, 87.

⁴⁵ *Ibid.*, pp. 16, 18-19, 86; *The William Farquhar Collection of Natural History Drawings*, Introduced by J. Bastin, vol.1, Singapore: Goh Geok Khim, 2002, p. 23.

The employment of Asian draftsmen more cheaply than Europeans boosted the scale of collections shipped home. Though the style of Asian artists, which conveyed their own idiom, did not often suit contemporary European taste,⁴⁶ their works helped improve scientific and public knowledge of tropical fauna and flora. Until the availability of reliable techniques of preservation particularly for fauna, drawings served as important backup for specimen types and continue to prove indispensable for taxonomic studies, especially in the absence or decomposition of type specimens. Furthermore, as works of Asian provenance, they lend a rare insight into the indigenous imaging of nature.

No less an enthusiast than Raffles was William Farquhar, the first British naturalist in the Peninsula. During his service in Melaka, he sent various species of Malayan plants to the Calcutta Botanic Gardens, recorded by Roxburgh in his *Plants of the Coast of Coromandel* (3 vols., 1795-1819). He also presented the first records of the Malayan tapir (*badak cipan*; *Tapirus indicus*) and the bearcat (*benturung*; *Arctictis binturong*) to the Asiatic Society of Bengal and discovered the fern *Matonia pectinata* on Mount Ophir (Gunung Ledang).⁴⁷

Metropolitan appreciation of the importance of colonial scientific research to imperial ambitions and welfare was evident in the warm encouragement given by Banks to the American naturalist Thomas Horsfield (1773-1859), employed by Raffles in Java:

Gentleman who, like you cultivate science in the wilderness of nature, where books are not to be found, have a right to call upon us inhabitants of libraries for every assistance you stand in need of.⁴⁸

Among other achievements, Horsfield's efforts yielded the first fauna collection for the English East India Company Museum, where he was subsequently employed as Assistant. Raffles himself achieved international recognition as a naturalist through association with the spectacular *Rafflesia arnoldi*, discovered in 1818 in Benkulen by the surgeon-botanist Joseph Arnold.⁴⁹

Colonial and metropolitan initiatives merged more often than is generally assumed, as evinced by Raffles's role in the creation in 1825/26 of the Zoological Society, London, of which he was first president. Following his death, zoological collections gifted by his wife to the Society introduced

⁴⁶ Archer, *Natural History Drawings*, pp. 57-8.

⁴⁷ J. Bastin, 'Sir Stamford Raffles and the Study of Natural History in Penang, Singapore and Indonesia', *JMBRAS*, 63, 2, 1990, pp. 3, 9; *The William Farquhar Collection*, I, pp. 20-3.

⁴⁸ S. Raffles, *Memoir*, p. 449.

⁴⁹ Bastin, 'Sir Stamford Raffles', p. 12.

Southeast Asian materials into the corpus of zoological and anatomical studies promoted by the Zoological Club of the Linnaean Society of London, also formed in 1826.⁵⁰ Again, the researches of the highly-talented botanist William Jack in Sumatra (1818-22), caught the attention of Sir Willian Hooker, Director of the Royal Botanical Gardens at Kew (1841-55). Jack's report, originally published in *Malayan Miscellanies*, was reprinted in the *Transactions* of the Linnaean Society.⁵¹

Natural History in the Peninsula: Mapping the Environment

1. Flora

Botanical Collection and Curation. Unlike the early tropical gardens created by Orta, Rheede and Rumphius for their personal research, those established by the EIC in Penang (1794) and Singapore (1822) were integral to its commercial aims for extending the chain of 'tropical Edens'. As centres for the naturalization and assemblage of exotic crops of diverse provenance, botanic gardens were perceived as symbols of scientific progress and imperial might.

In Penang's function as an entrepôt, agricultural experimentation was envisaged as part and parcel of its potential for servicing trade with China. The island's Botanic Gardens, founded in 1794 barely seven years after Calcutta's, were placed under Christopher Smith (d. 1806). Commissioned by Roxburgh to acquire spice plants from Maluku during the Napoleonic Wars (1795-1815), he used the opportunity to collect thousands of other rare and valuable specimens.⁵² The transference of nutmeg to Penang was the outcome of the successful introduction of the crop to Benkulen by Roxburgh Jr.⁵³

As in Penang, imperial economic ambitions inspired botanical experimentation in Singapore. Nathaniel Wallich, Danish Superintendent of the Calcutta Botanical Gardens (1815-46), noted the presence near Singapore of gambier, which had fast gained a market for tanning in China. Its cultivation, as well as that of pepper was encouraged among the early settlers by Resident John Crawford (1823-6).⁵⁴ On the same visit in 1822, Wallich's interest turned to the diversity of the island's 'primeval forest' brought to attention by William Jack's discovery in 1819 of new tree species. Realizing the urgency for collection, preservation and cultivation of economic species

⁵⁰ Ibid., p. 21.

⁵¹ Ibid., pp. 13, 16.

⁵² A. M. Coats, *The Quest for Plants: A History of Horticultural Explorers*, London: Studio Vista, 1969, p. 205.

⁵³ Marsden, *A History of Sumatra*, pp. 146-7.

⁵⁴ Burkill, *Dictionary*, I, p. 2242.

in the face of rapid land clearance, he proposed, in 1822, the creation of the Singapore Botanic Gardens on the model of the Calcutta Gardens⁵⁵ Apart from its local importance for the protection of soil and climate, the economic potential of Singapore's flora as a whole attracted the attention of the Royal Botanic Gardens at Kew, at the fulcrum of the imperial botanical research network. Preceded by St. Vincent (1765), Jamaica (1750), Calcutta (1786) and Trinidad (1818), the Singapore Botanic Gardens, founded by Raffles was followed by later creations at Malta, Mauritius, St. Helena and in the Australian colonies. Each provided the British Empire with a window for the exploration of regional floras.

British presence in the Straits Settlements (SS) (Penang, Singapore and Melaka) as a whole opened the way for botanical exploration of a yet unstudied territory. Collections assembled by G. Porter (Potter), Superintendent of the Penang Botanic Gardens (1823-34) and visiting botanists, including Jack⁵⁶ and G. Finlayson (see below), contributed to pioneer studies of the flora of the Peninsula begun at the Calcutta Botanic Gardens. William Griffith (1810-45) assembled the earliest large Malayan collection, surpassed in size and importance only by that of the Melaka Magistrate, A.C. Maingay (1862-8), who is commemorated in several plant names.⁵⁷

Singapore's surgeons, who took an avid interest in economic botany and owned private spice plantations, were founder members of the island's Agricultural and Horticultural Society, established in 1836.⁵⁸ Thomas Oxley reputedly maintained the best nutmeg plantation and, on the outbreak of the nutmeg disease, published a long paper on possible remedies.⁵⁹ Natural history, which developed out of a vested interest in private agricultural enterprise, probably explained Oxley's parallel expertise on the tiger population of the island that reputedly posed a serious threat to cultivators.⁶⁰

⁵⁵ R. Hanitsch, 'Letters of Nathaniel Wallich relating to the Establishment of the Botanic Gardens in Singapore,' *JSBRAS*, 65, 1913, pp. 39-48; Kathirithamby-Wells, *Nature and Nation*, p. 31.

⁵⁶ Jack's collections were lost with Raffles's in the fire on board the 'Fame' but some of the duplicates in the possession of Wallich, kept in Calcutta, erroneously labeled as Penang, were actually assembled in Sumatra. M.J. van Steenis-Kruseman, *Malaysian Plant Collectors and Collections*, C. G. G. J. van Steenis, general ed., *Flora Malesiana*, ser. 1, vol. 1, First published in 1950; Koenigstein: Koeltz Scientific Books, 1985, p. 257; van Steenis 1948-9, ser.1, vol. 4², p. cxv; W. Jack, 'Letters to Nathaniel Wallich 1819-1821', *JSBRAS*, 73, 1916, pp. 239-41.

⁵⁷ *Flora Malesiana*, 1948-9, ser 1, vol. 4², p. cxvi.

⁵⁸ C. B. Buckley, *An Anecdotal History of Old Times in Singapore*, First published in 1902, Singapore; Kuala Lumpur: University of Malaya Press, 1965, pp. 304-5, 315.

⁵⁹ T. Oxley, 'Some account of nutmeg and its cultivation', *Journal of the Indian Archipelago (JIA)* 2, 1848, pp. 641-60.

⁶⁰ Buckley, *Old Times in Singapore*, pp. 220-1.

Oxley published some of the earliest accounts of the zoology and botany of Singapore.⁶¹

As in the medical profession, service in the colonial army involved familiarization with new territory, allowing much scope for the amateur naturalist. In addition to basic information on climate and terrain, knowledge of signal species of plants, trees and animals was imperative not only for the daily needs of subsistence but also for countering indigenous strategies of guerrilla warfare and resistance. Deficiency in this respect could render superior arms ineffective. A case in point was the poison darts, which took a heavy toll of the Portuguese invaders of Melaka in 1511, later identified with the substance (*upas* or *ipuh*) extracted from the tree *Antiaris toxicaria*. Though widely used in the region, indigenous information about *upas* was concealed or distorted, calculated to intimidate. Even Rumphius, despite his long residence and indigenous connections in Maluku, was drawn into the fabulous myths surrounding its potency:

Under the tree itself no plant, shrub or grass grows—not only within its periphery but, even, not within a stone's throw of it: the soil is sterile, dark and as if burned. Such a poisonousness does the tree exhibit that from the infected air birds perching on the branches are stupefied and fall dead, and their feathers strew the soil.⁶²

The terror struck by tales of the *upas* poison remained with European soldiers⁶³ and spurred research into unveiling its mystery. An account of the *upas* published by N. P. Foersch in 1785 in the *London Magazine* drew wide public interest and a dissertation on the effects of the poison was presented in Paris as well as to the Royal Society in London. Reputedly, the Dutch obtained information about *Crinum asiaticum*, the antidote for the poison, from an indigene under torture. But it was Charles Campbell who, on the basis of a specimen he saw in the interior of Benkulen, finally dispelled the myth surrounding the devastating strength of its potency:

I have sat under its shade, and seen birds alight upon its branches; and as to the story of grass not growing beneath it, every one who has been in a forest must know that grass is not found in such situations.⁶⁴

Horsfield, in a paper in the *Batavian Transactions* (vol. vii), attempted an identification of the sources of *upas* and some observations of its

⁶¹ T. Oxley, 'The Zoology of Singapore', *JIA*, 3, 1849, pp. 594-7; T. Oxley, 'The Botany of Singapore', *JIA*, 4, 1850, pp. 436-40.

⁶² Burkil, *Dictionary*, I, p. 177.

⁶³ J. Crawford, *History of the Indian Archipelago*, Edinburgh: A. Constable, 1820, p. 270.

⁶⁴ Marsden, *A History of Sumatra*, p. 110.

preparation.⁶⁵ Consistent with the EIC army's interest in the substance, it was Captain Newbold during his service in Melaka (1832-5) who produced the first detailed description of its source and preparation.⁶⁶ Much of the Peninsula at this stage was unfamiliar to the European naturalist. As George Finlayson, the Scottish surgeon, observed in 1821:

In speaking of the peninsula of Malacca...its unfrequented forests seemed to contain zoological treasures yet unknown to us... There seems every reason to believe that an extensive search would be attended with the happiest results to the science of natural history.⁶⁷

Close and patient observation of nature gave Finlayson a rare insight into its workings. He was possibly the first naturalist to appreciate the value of the mangrove forest for coastal protection. '[H]ow ill judged is the practice of destroying barriers of this sort', he commented, on a process already ongoing in the pioneer settlement of Singapore.⁶⁸

Policing the interior following the Naning War gave Newbold the opportunity for exploring the people and landscape around Melaka, which had a greater attraction for him than the commercial affairs of Singapore and Penang. He hunted for plant specimens on Mount Ophir, an interest later expanded during his extensive travels in Sind and the Middle East, while adding to the collection of the Royal Asiatic Society in Bombay.⁶⁹ Helped by his knowledge of the Malay language, he combined official business with exploring Muar, Rembau and Linggi and recorded every aspect of Malay life and custom, especially in the Minangkabau landscape. His account of the Malays, considered 'the first attempt by a Westerner to write history from an indigenous point of view'⁷⁰ derived from a genuine interest in the organization and workings of their society within the framework of a particular landscape.⁷¹ The first detailed descriptions by Newbold of indigenous technology, ranging from Malay agriculture to mining⁷² derived from an acute understanding of indigenous interaction with the natural world. He recorded with equal sensitivity the lives of the forest and sea people,

⁶⁵ Raffles, *The History of Java*, II, pp. 44-6, note.

⁶⁶ T. J. Newbold, *British Settlements in the Straits of Malacca*, First published in 1839, London; Introduction by C. M. Turnbull, Kuala Lumpur: University of Malaya Press, 1971, II, pp. 401-4.

⁶⁷ G. Finlayson, *The Mission to Siam and Hué, the capital of Cochin China, in the years 1821-2, from the Journal of the late George Finlayson, Esq.*, ed. S. Raffles, First published in 1826, London; Introduction by D.K. Wyatt, Bangkok: Siam Society, 1988, pp. 260-1.

⁶⁸ *Ibid.*, pp. 59-60.

⁶⁹ Turnbull, 'Introduction', in Newbold, *British Settlements in the Straits of Malacca*, p. vi.

⁷⁰ *Ibid.*, p. xiii.

⁷¹ See Newbold, *British Settlements in the Straits of Malacca*, vol. II.

⁷² *Ibid.*, II, 99-103, 194-214, 260-1 note.

observing the beliefs and superstitions that ostensibly enhanced their innate skills.

Newbold took his knowledge of the tropical environment in the Straits Settlements to Madras, where he earned a reputation as a naturalist and an Orientalist of some eminence. He was later elected Fellow of the Royal Society. Familiar with the barren landscape of the tin mines of Negeri Sembilan, Newbold made a seminal link between deforestation and the sand dune formations and siltation in the Hoogri River, lying between Bellary and Bangalore. The observation, published in 1839 in the newly formed *Madras Journal of Literature and Sciences*, alerted the Assistant Surgeon E. G. Balfour about the potential threat of erosion to local climate and agriculture.

While Newbold was 'the first in a line of communicators' on the subject, J. R. Logan brought his Peninsular experience directly within the focus of the deforestation debate in India steered by the French agricultural chemist J. B. Boussinghault, based on the observations of Alexander von Humboldt during his South American travels.⁷³ Logan's observations of tropical erosion exacerbated by indiscriminate human activity in Rembau, Negeri Sembilan, and on the summit and slopes of Penang hill, corroborated evidence in India. His lecture to the Bengal Asiatic Society in 1846, later published in the *Journal of the Indian Archipelago*, was hugely influential and put the Peninsula at the heart of the emerging discourse on tropical ecology.⁷⁴

Penang, the perceived tropical paradise of abundance and stability, soon revealed its vulnerability to human despoilment, and this Logan was quick to grasp. For, unlike the surgeon-naturalists who were involved largely in taming the landscape for productivity, Logan was drawn by nature in the wild and noted with admiration the adaptability of the forest people, 'living familiarly with her, with body and mind attuned to her influences and vicissitudes'.⁷⁵ His deep appreciation of indigenous life impelled him to bring to science the vast store of untapped traditional knowledge surrounding the rich plant life of the Peninsula. Logan sought after the well-guarded herbal and pharmaceutical knowledge of old Malay women and scoured local shops for samples.⁷⁶ A lawyer by profession, he had established an affinity with the Scottish botanical fraternity during his earlier career as an indigo planter in India. He was one of a number of amateur naturalists, including officers of the civil and military administration who laid the foundations of natural history in the Peninsula. *The Journal of the Indian Archipelago* (1847-58) he

⁷³ Grove, *Green Imperialism*, pp. 428-9.

⁷⁴ Kathirithamby-Wells, *Nature and Nation*, pp. 41-2; Grove, *Green Imperialism*, p. 439.

⁷⁵ J. R. Logan, 'Five days in Nanning, with a walk to the foot of Gunong Datu in Rembau', *JIA*, 3, 1849, p. 409.

⁷⁶ Kathirithamby-Wells, *Nature and Nation*, p. 34.

founded bore the stamp of a nineteenth-century naturalist who subscribed to a variety of interests including geology, geography, biology and ethnography.

When in 1846 the Singapore Botanic Gardens was disbanded as an economic measure, it was largely the amateur naturalists and prominent members of the merchant community who kept horticultural interests alive. In 1859 they initiated the formation of the Agri-Horticultural Society.⁷⁷ However, official policy with regards to botany and natural history in the colonies experienced a sea change with the establishment of the Hooker dynasty at the Royal Botanic Gardens at Kew. The Hookers believed that progress in natural history could best be served by its promotion as an interactive enterprise between centre and periphery rather than through a unilateral enforcement of metropolitan policy. Driven by this objective, Sir William Hooker as Director (1841-55), worked towards setting the Kew Botanic Gardens at the hub of an empire-wide network for the collection, study, experimentation and interchange of plant species.

In 1867 when the Straits Settlements were transferred to the Crown, Joseph Hooker who succeeded his father as Director (1855-85), seized the opportunity to bring botanical affairs in the Peninsula, hitherto subsumed within the activities of the Calcutta Botanic Garden, within the direct influence of Kew. Hooker found a keen ally in Governor Andrew Clarke (1873-5) who clearly intended that economic botany should follow the quest for tin. Hardly three months after the 1874 Pangkor Treaty the Governor pressed Lord Carnarvon, Secretary of State for the Colonies, himself a keen botanist and collector, for the services of a 'scientific botanist'. The outcome was the appointment the following year of the Kew-trained botanist, Henry Murton, to superintend the Singapore Gardens in Tanglin (1875-80). These gardens were originally established by the Agri-Horticultural Society, soon after its formation, for the dual purpose of experimentation and public recreation.

Likewise, the Penang Botanic Gardens, abandoned in 1834,⁷⁸ was re-established in 1884 at a new site named 'the Waterfall Gardens' and placed under Charles Curtis as Assistant Superintendent (1884-1903).⁷⁹ The reorganization made room for Hooker's commitment to forest conservation, stemming from increasing concern within botanical circles about the impact of tropical deforestation on climate and landscape.⁸⁰ The Botanic Gardens in Singapore, Melaka and Penang took charge of the first Forest Reserves

⁷⁷ Ibid., p. 36.

⁷⁸ The Penang Botanic Gardens had a chequered history. Abolished in 1805, it was revived by Nathaniel Wallich when he visited the island in 1822 and was placed under the charge of George Potter/Porter. In 1834, Governor Kenneth Murchinson's lack of interest resulted once again in its disbandment.

⁷⁹ Kathirithamby-Wells, *Nature and Nation*, pp. 48-9.

⁸⁰ Ibid., p. 61.

created in their respective areas.⁸¹ Encouraged by Hooker's initiative, the naturalist and British Resident in Perak, Hugh Low (1877-89), took positive steps in the direction of forest protection, particularly in the Larut Hills, to safeguard the State's water and timber needs for development.⁸²

Official enthusiasm for botanical research laid the foundations of taxonomic studies. At Penang, the herbarium collections of Curtis made a substantial contribution to the *Materials for a Flora of the Malayan Peninsula* (5 vols., 1889-1915) by George King, Superintendent of the Calcutta Botanic Gardens (1871-98).⁸³ An even more important contribution to King's achievement was the Perak herbarium. This valuable collection was assembled at the Perak Museum in Taiping founded by Low, where Leonard Wray Jr. was Curator (1883-1908). Wray was the first to investigate the montane fauna and flora of the Peninsula and discovered for science the Malayan species (*wrayi*) of the genus *Rhododendron*, introduced to science by Joseph Hooker following his Himalayan excursions.⁸⁴

The Perak administration's contribution to taxonomy was enhanced by the encouragement lent to visiting botanists by Low. Apart from facilitating King's visit, Low arranged for plant collections by other eminent botanists, including Herman Kunstler for the Royal Botanic Gardens, and the Roman Catholic priest, Rev. Father Benedetto Scortechini, employed as Government Botanist (1884-6). The collections of Scortechini and Wray, besides providing data for King's magnum opus, were later used by H. N. Ridley for his signal contribution, the *Flora of the Malay Peninsula* (1922-5).

Apart from his botanical pursuits, Wray built an extensive ethnographic collection for the Perak Museum, laying the ground for the State's lead role in the study of Malayan anthropology. The 'Perak Exhibit' at the Great Empire Exhibition of 1885 in London, which included ethnographic photographs, was the fruit largely of Wray's labours. In fact, so great were Low's demands on Wray to support research at the Calcutta and Kew Botanic Gardens that his father was obliged to plead with Thiselton-Dyer (1885-1905), the new Director at Kew, to 'speak a good word for him' with the Resident. Wray Sr., then living in the Peninsula, wrote:

⁸¹ The 3575 hectare Forest Reserve in Penang was set aside for recreation and fuel. Curtis discovered several new species and one genus. Under Curtis's successor, Walter Fox (1893-1910), management was affected by staff shortage. D.S. Jones, 'The Waterfall "Botanic Garden" on Pulau Pinang: The Foundations of the Penang Botanic Gardens, 1884-1010', *JMBRAS*, 70, 2, 1997, pp. 76, 88-9.

⁸² Kathirithamby-Wells, *Nature and Nation*, pp. 61-2.

⁸³ Jones, "The Waterfall "Botanic Garden"", p. 85. Curtis's collection was incorporated in 1910 into the herbarium in the Botanic Gardens, Singapore. I. H. Burkill, 'Botanical Collectors, Collections and Collecting Places in the Malay Peninsula', *The Gardens' Bulletin*, Straits Settlements, 4, 4 and 5, 1927, p. 119.

⁸⁴ Wray, Taiping, to Thiselton-Dyer, 21 April 1885; Wray to Thiselton-Dyer, 31 Oct. 1886, Directors' Correspondence 168, Royal Botanic Gardens, Kew (RBGK).

He [Leonard] is overwhelmed with work of all kinds, often obliged to be hard at it till 10 or 11 o'clock at night as 'science officer' of the state...The Authorities here throw upon him every species of work, electrical, chemical, geological, and photographic...that he never has any leisure time.⁸⁵

Low evidently had been under pressure from Joseph Hooker, whose ambitions for maintaining Kew at the heart of colonial botanical research had undermined the interest of colonial servants in building local collections. In fact, Andrew Clarke, who pioneered the idea of a Singapore herbarium, which Murton later established, was keen on securing from Hooker the return of Maingay's plant collection. Any chance of its recovery was prejudiced by Hooker's own ambition to compile a study of Malayan flora to rival King's project in Calcutta. His relations were similarly strained with Scortechini when the collector decided to share part of his Perak collection with King for writing the *Materials for a Flora of the Malayan Peninsula*. Despite gaining the approval of the Malayan government, Scortechini was subsequently obliged to placate Hooker by depositing the whole collection in Kew.⁸⁶ Only upon Hooker's retirement and the removal of his domineering personality were the Perak Museum and the Singapore Botanic Gardens able to abandon the automatic consignment of all local collections to Kew in favour of building their own herbaria.⁸⁷

Upon the retirement of Murton's successor, Cantley (1883-8), the government was offered the opportunity to establish curation and research in the Peninsula on a more independent and scientific footing. In seeking a replacement for Cantley, Governor Sir Cecil Clementi Smith requested the Colonial Office for a scientific man of 'social standing' to replace the existing Superintendent, selected from among professional gardeners. As a result, in 1888, Ridley was appointed Director of the Forests and Gardens of the Straits Settlements, placing him on a par with the Directors of the Botanic Gardens in Ceylon and Jamaica. The event heralded the Peninsula's transition from nineteenth-century pioneer exploration, collection and curation—a largely amateur endeavour—to scientific botany of an international order.⁸⁸ In addition to Ridley's extensive exploration of the flora of the Archipelago, in 1891 he created the *Agricultural Bulletin*. It provided

⁸⁵ Wray, Melaka, 3 Nov. 1885, Directors' Correspondence, 168, RBGK.

⁸⁶ Scortechini, Taiping, to Hooker, 6 March 1886; Scortechini, Teluk Anson, Perak, to Hooker, 2 Aug. 1886; Sir Ferdinand Jacob Heinrich von Mueller to Hooker, 3 Nov. 1888, Directors' Correspondence, 168, RBGK.

⁸⁷ Burkill, 'Botanical Collectors', p. 119.

⁸⁸ No. 19, Clarke to Carnarvon, 9 April 1894, Singapore Botanic Gardens, Misc. RBGK; Kathirithamby-Wells, *Nature and Nation*, p. 49.

useful information on local timbers, rattans, fibres and dyes. The introduction in 1912 of the *Gardens' Bulletin*, which superseded the *Agricultural Bulletin*, marked an important stage in the development of systematic botany in the Peninsula.⁸⁹ Taxonomic research for the whole of Malesia, according to C. G. G. J. van Steenis, hinged on Ridley in Singapore, and T. Valeton⁹⁰ in Bogor.⁹¹

In the Peninsula, as much as in India and the Netherlands East Indies, botanical investigation hinged on indigenous collaboration. Malays and Orang Asli were essential porters and guides without whom no scientific expedition could set out. They were indispensable informants on plants, their properties and uses, and the habits and distribution of animals. Malays and Orang Asli were recruited by the forestry and game departments as forest guards and game rangers. An outstanding collector was Mohamed Haniff. He served in the Penang Waterfall Gardens (1892-1912), collected extensively and is commemorated in the genus *Haniffia* (Zingiberaceae).⁹² Again, William Griffith, the Company surgeon who served in Melaka (1841-2) and returned there to collect in 1845, employed the Eurasian E. Fernandez on the first occasion and 'Verapha' (Verappa) and Ningul on the second.⁹³

The cohort of Singapore collectors who served Ridley and his successor, I. H. Burkill (1912-25), included Ahmad bin Haji Omar, Ahmad bin Hassan, Subramaniam, Kiah bin Mohammad Salleh and Kastawari.⁹⁴ They scoured the Peninsula and the surrounding region for plant specimens to be sent to Kew, duplicates of which formed the basis of an independent collection in Singapore. No less important were the Forest Guards Tachun Baba and Sow Tandang. Employed in the inter-war period in the Forest Department, they contributed to the long-standing reputation of the Orang Asli as experts in tree climbing and tree identification in the sphere of forestry.⁹⁵

⁸⁹ J. W. Purseglove, *The Ridley Centenary: 10 December 1955*, Singapore: The Botanic Gardens, 1956, p. 7; B. Tinsley, *Singapore Green: A History and Guide to the Botanic Gardens*, Singapore: Times Books International, 1983, p. 38.

⁹⁰ T. Valeton joined the staff of the Buitenzorg Botanic Gardens in 1892 and headed the Herbarium during 1903-13. He was author of the botanical text of *Bijdragen tot de Kennis der Boomsoorten op Java* and wrote numerous taxonomic papers.

⁹¹ C.G.G.J. van Steenis, ed., *Flora Malesiana*, 1960-72, ser.1, vol. 6, Groningen: Wolters-Noordhof, p. 9.

⁹² Mohd. Nor Jamalul Lail, 'Muhamad Haniff (1872-1930) of the Penang Botanic Gardens: A Biographical Tribute to a Pioneer Botanist', *Flora Malaysiana*, 2, 2000, pp. 27-32.

⁹³ *Flora Malesiana*, 1950, ser. 1, vol. 1, p. 201.

⁹⁴ van Steenis-Kruseman, *Flora Malesiana*, ser.1, vol.1, pp. 436-7; *passim*.

⁹⁵ K.P.V. Menon, *History and Development of Forestry and Forest Industries in Malaysia: A Bibliography*, Kepong, Kuala Lumpur: Forestry Research Institute Malaysia (FRIM), 1976, p. 8.

Intimate plant knowledge among local employees assisted the discovery of many new to science and the absorption of a number of vernacular names such as *kempas* (*Koompassia*), *pandan* (*Pandanus*) and *nipah* (*Nypa*) into scientific nomenclature. Equally, indigenous names for timbers, pre-eminently *meranti* and *cengal*, attained the status of trade names on the international market. Malay knowledge, as shown below, proved also invaluable for commerce and the innovation of new industries.

Plants and Colonial Industry. The Great Exhibition of 1851 at the Crystal Palace in Hyde Park, which displayed representative samples of colonial resources, was a microcosm of empire. Empire and science, which found common ground in biogeography, co-sponsored the surveying, mapping and inventorying of people, lands and products for the ends of imperial power. Tropical nature, once a source only of wonderment, was brought to the domestic market place.⁹⁶

High on the imperial economic agenda were the Malayan territories, the source of *gutta percha* (from *Palaquium gutta*). Ingeniously adapted by the Malays for the production of riding whips for sale in the local market, the plastic qualities of *gutta percha* were investigated for medical and industrial use by the Company surgeons, T. Montgomerie (1819-43) and T. Oxley (1846-57). José Almeida, the private surgeon-cum-agricultural entrepreneur, recognized its value for medical purposes such as the manufacture of surgical gloves. At the same time Oxley successfully pioneered the use of *gutta percha* for plastering fractures and preserving vaccine, the latter hitherto unable to be kept even for a few days.⁹⁷ When a Prussian artillery Officer, Werner von Siemens, then perfected its use for insulating telegraph cables, the product immediately gained strategic importance for the empire.⁹⁸ Similar adaptation of other indigenous uses of plants paid dividends to industry and agriculture. In 1902 the medical doctor, J.M. Gimlett, noted the wide use of *Derris elliptica* (*akar tuba*) for poisoning river fish and adopted by Chinese gardeners for killing caterpillars. This observation contributed to scientific collaboration within the empire towards the discovery of insecticides.⁹⁹

The emergence of *Hevea* rubber in the Peninsula, superseding *gutta percha* as an industrial product was, again, the result of scientific exchange within the close-knit colonial botanical network. The illegal exportation by Kew of the seedlings from South America to Ceylon and the Singapore

⁹⁶ R. Desmond and J. Moore, *Darwin*, London: Michael Joseph, 1991, p. 392.

⁹⁷ Kathirithamby-Wells, *Nature and Nation*, pp. 45-6.

⁹⁸ R. Drayton, *Nature's Government: Science, Imperial Britain, and the 'Improvement' of the World*, New Haven: Yale University Press, 2000, p. 194.

⁹⁹ M. Watson, 'Forward', in J. D. Gimlette, *A Dictionary of Malayan Medicine*, H. W. Thomson ed. and comp., First published in 1939, London; Kuala Lumpur: Oxford University Press, 1971, pp. vi-vii.

Botanic Gardens was justified on grounds of the claimed threat to all varieties of rubber-bearing trees by the destructive indigenous practice of felling for extraction.¹⁰⁰ Out of the seedlings sent in 1877 to Singapore, seven were planted by Hugh Low in the Perak Residency Garden. These and those raised in the Botanic Gardens furnished the seeds for the first plantations.¹⁰¹ Though an introduced species, indigenous knowledge and experience of tapping a wide variety of gums and exudates, perfected by Ridley, benefited the plantation industry. This and his discovery that *Hevea* rubber could be tapped more intensively than other rubber-yielding trees scored a major triumph for the colonial plantation industry.¹⁰²

Despite the economic success of plantation rubber, monocultivation was destined to upset the delicate balance between productivity and environment. Large areas of Melaka had already been laid to waste by Chinese cultivators of a fast-growing variety of Brazilian cassava introduced in 1886 by Cantley.¹⁰³ The same cultivators soon turned the *Imperata* grasslands to rubber, but its rapid spread meant that a number of native plant species either became very rare or were entirely exterminated.¹⁰⁴ The wild ancestor of the domestic mangosteen (*Garcinia mangostana*) is a likely example. Some specimens enumerated by Kunstler and Scortechini, never again collected in the Peninsula, attest to their immense value to botanical knowledge.¹⁰⁵

2. Fauna

Pioneer Naturalists and Hunters. Ironically, despite the contribution of tropical biology to the Darwin-Wallace theory of evolution, the study of zoology was left for the better part of the nineteenth century to the enthusiasm of amateur naturalists, with little official support in the colonies. In addition to Oxley (see above), these included the military officer, P.J. Begbie, and a number of visiting naturalists, the foremost of them the eminent Alfred R. Wallace. It was in the Peninsula that Wallace gained his first glimpse of the astounding diversity of the Archipelago, which he

¹⁰⁰ Drayton, *Nature's Government*, p. 236.

¹⁰¹ Chai Hon-Chan, *The Development of British Malaya, 1896-1909*, Kuala Lumpur: Oxford University Press, 1964, p. 153.

¹⁰² Burkill, *Dictionary*, I, pp. 1171-3.

¹⁰³ Kathirithamby-Wells, *Nature and Nation*, p. 71.

¹⁰⁴ H. N. Ridley, *The Flora of the Malay Peninsula*, London: L. Reeve, 1922, pp. xiii; xvi; V. Narayanaswami, 'Provenance of Early Malayan Plant Collectors', *Journal of the Asiatic Society of Bengal*, n.s., 27, 1931, pp. 327-30. After 1890, however, Wray ceased sending his collections to Calcutta and retained them at the Taiping Museum. Narayanaswami, 'Provenance', p. 331.

¹⁰⁵ Purseglove, *The Ridley Centenary*, p. 7; Tinsley, *Singapore Green*, p. 38.

subsequently explored extensively. While Wallace combined the task of collector and field scientist, Darwin relied on him, in part, for the purchase of specimens, shipped at great cost. Commenting on the skins of domestic fowls sent to him by Wallace, Darwin reportedly moaned: 'The carriage is costing me a fortune!' During his visit to Singapore in 1854 Wallace identified, within just a square mile, some 700 species of beetles, many new to science. He also brought to science *Prothoe calydonia*, a butterfly of great beauty spotted in Melaka.¹⁰⁶

From Wallace who focused mainly on birds and insects, we learn something of the reliance on indigenous collectors who helped him. The name, Ali Wallace was emblematic of the close relationship between Wallace and his Bornean Malay guide, collector and later head man.¹⁰⁷ A keen naturalist, he brought the attention of Wallace to a species of the genus *Pitta* in Buru (Maluku), of which he obtained a specimen at his own initiative, exercising much patience and enduring personal discomfort.¹⁰⁸ He was also the first to describe Wallace's *Standardwing* (*Semioptera wallacii*), a shot specimen of which he obtained for Wallace in Bacan (Maluku) but, nonetheless, the name was attributed to the master.¹⁰⁹ Acknowledgement of indigenous assistance in the collection of birds and mammals was rare, in contrast to the meticulous recording of local collectors in botany. This may have arisen from the popularity of zoological collecting and hunting as a combined activity among Europeans, with local participants acting largely as guides and trackers.¹¹⁰

In the Peninsula, as elsewhere in the region, amateur interest rested predominantly in large vertebrates and birds, relative to the modest subscription to other fauna. Compared for example with the greater diligence involved in the collection and identification of insects, the procurement of birds and mammals, whether as trophies or scientific specimens, offered the thrill and spectacle of the hunt. Birds, especially, had a special attraction because of their small size and colourful plumage.

A versatile collector during the 1840s and early 1850s was the EIC's Danish surgeon T. E. Cantor, whose interests covered mammals, birds and fish. However, in contrast to Wallace's collection based on his own field studies, the value of Cantor's specimens was compromised by his reliance on visiting traders and ships for specimens.¹¹¹ Still rarely available in the East, the lens was used by Cantor for his expert microscopic drawings of

¹⁰⁶ Wallace, *The Malay Archipelago*, pp. 19, 22.

¹⁰⁷ *Ibid.*, pp. 240-1, 244, 312.

¹⁰⁸ *Ibid.*, pp. 298-9.

¹⁰⁹ *Ibid.*, pp. 252-3.

¹¹⁰ See Kathirithamby-Wells, *Nature and Nation*, pp. 192-5.

¹¹¹ D. R. Wells, *The Birds of the Thai Malay Peninsula*, London: Christopher Helm, 2007, II, p. 726.

unicellular organisms made in Chusan during 1840-4, while serving a regiment in the Opium War.¹¹²

In the decades that followed, the increased use of field glasses and telescopes revolutionized the study of mammals and birds. It established ornithology as a serious discipline and a branch of behavioural science involving patterns of distribution, breeding and migration,¹¹³ and likewise facilitated the observation of mammals. Abolition of EIC rule in 1858 terminated the tradition of surgeon-botanists and patronage for natural history draftsmen. Instead, resulting from improved techniques of preservation, patronage shifted to the collection of specimens. This and the wider use, by the late nineteenth century, of the lens and field glasses marked the beginning of a new era. In the Peninsula, British intervention in 1874 expanded the arena for amateur adventure and exploration enhanced by technical innovations. The steadily growing government establishment and business community included a mix of keen naturalists and trophy hunters who contributed to the pursuit of natural history as a badge of empire. Their numbers were boosted by visiting Indian civil servants and sportsmen who, having 'exhausted every variety of game to be found in the jungles of India', sought adventure further a field.¹¹⁴

Other than those drawn into trophy hunting, a naturalist of rare distinction was A. H. Hume, a British civil servant in India and founder of the Congress Party. Regarded the 'father of Indian ornithology' he successfully pursued his amateur interest by employing a network of informants and collectors, covering an extensive area including the Malay Peninsula. These regional surveys involved the enumeration and the grouping of species and genera. Besides publishing the journal, *Stray Feathers* (1873-99) based on the data collected, Hume and his field curator, W.R. Davidson made an outstanding contribution to biogeography by identifying the land boundary of the Sunda region and confirming all the lowland forest avifauna. An equally dedicated observer and collector was H.R. Kelham, military officer assigned to the Peninsula in 1877 and 1879-80. His *Ornithological Notes* (1881-3), covering about 200 species mainly from Perak, is described 'as one of the more detailed observational records of the period'.¹¹⁵

Among active naturalists of private means was the mineral prospector, J. Waterstradt. His exploration of the Tahan massif, in 1901, led to his discovery of the mountain peacock pheasant (*Polyplectron inopinatum*), described by Lord Walter Rothchild. Another was W.L. Abbott, medical

¹¹² Archer, *Natural History Drawings*, pp. 52-3.

¹¹³ A. Larsen, 'Equipment for the field,' in Jardine *et. al.* eds., *Cultures of Natural History*, p. 373.

¹¹⁴ I. Oliphant, *Narrative of the Earl of Elgin's Mission to China and Japan in the Years 1857, 1858 and 1859*, New York: Augustus M. Kelly, 1859, I, p. 24.

¹¹⁵ Wells, *The Birds of the Thai Malay Peninsula*, p. 728.

doctor-turned-zoologist and ethnologist. One of the early collectors in coastal Pahang and Terengganu, he complemented the work of Davison in the Pahang littoral and the zoological and anthropological endeavours of R. Evans and F.F. Laidlaw on the Cambridge University Skeat Expedition (1899-1900) to the central Peninsula.¹¹⁶

Dedicated to collecting zoological specimens for study was the large community of professional collectors who worked for museums and private patrons. Big game hunters, like H.C. Syers, First Commissioner of Police in Selangor, were often the most knowledgeable about large mammals and their behaviour within their native habitat. Representative of the trans-national hunting and collecting fraternity, he was a founder and contributor to the Selangor Museum, established in 1878 (see below). He made the acquaintance of W.T. Hornaday who secured specimens in Selangor for the natural science collection of Rochester University, New York.¹¹⁷ Syers may also have assisted Hornaday in the same way that he supplied Davison, who collected for Hume before he became Curator of the Raffles Museum.

Hunting was also widespread among the Malay aristocracy; but whether any of the royal trophies entered museum collections remains unknown. Tengku Kudin of Selangor was a keen hunter and set the record for the biggest elephant ever shot in the Peninsula. Johor's rulers were renowned hunters-cum-naturalists and Maharaja (later Sultan) Abu Bakar of Johor (r. 1862-95) showed a deep concern for wildlife preservation. Confronted by Melaka's reputation as a major centre of trade in preserved bird skins and specimens, he was especially committed to the protection of avian species in the wild.¹¹⁸ Up to the end of the nineteenth century it was from Melaka that nearly all Malayan specimens reached Europe. Even after the port lost a greater part of its international trade to Singapore, its bird trade continued to thrive based on the expertise of local collectors and its easy access to a forested hinterland.¹¹⁹ The trade was based on the expertise largely of Melaka Eurasians of Portuguese extraction (*serani*) and some Indians, who also collected thousands of plant specimens that found their way into herbaria in Singapore and Kew.¹²⁰ To arrest excessive collecting in and around Mount

¹¹⁶ Ibid., p. 729.

¹¹⁷ W. T. Hornaday, *The Experiences of a Hunter and Naturalist in the Malay Peninsula and Borneo*, Introduction by J. M. Gullick, First published as *Two Years in the Jungle*, Pts. 3 and 4, New York: Scribner's Sons, 1885; Kuala Lumpur: Oxford University Press, 1993, pp. ix, 11, 38, 150.

¹¹⁸ Hundreds, possibly thousands of specimens exported from Melaka still survive in museums around the world. Personal communication: D.R. Wells.

¹¹⁹ In the absence of direct documentation for the bird trade, labels on specimens originating in Melaka that found their way into European museums serve as reliable evidence.

¹²⁰ Burkill, 'Botanical Collectors', pp. 116, 121, 182-3.

Ophir for the Melaka bird trade, Sultan Abu Bakar introduced the first conservation ordinance in the Peninsula, namely, the '1884 Johor Ordinance for the Protection of Bright-Plumed Birds'.¹²¹

Institutional Exploration, Research and Curation. As of the eighteenth century, subscription to the ethos of the naturalist as serving a national purpose conjoined with the increased public interest in the exotic tropics creating the need for public venues for curation and display. In 1753, when the British Museum was set up in Bloomsbury, the burgeoning of empirical research and popular science through travel, service abroad and the wider circulation of books and literature, justified the setting up of a natural history section, based on the extensive private collections of the London physician Sir Hans Sloane (1660-1753), aristocrat-physician, President of the Royal Society and the Royal College of Physicians. Branches created by the British Museum in 1837 for botany, zoology and geology developed into separate departments during 1856-57. These were then consolidated in 1887, incorporating the East India Company Museum Collection, within the prestigious premises of the new Natural History Museum at South Kensington. Like the Botanic Gardens in Kew, the Natural History Museum supported research derived from data and specimens collected in the colonies (see below), as well as serving the public to which it opened its doors in 1881.

By the end of the nineteenth century, a new class of naturalist emerged through university-based training and research in natural sciences. In the tradition of the early natural history explorations, natural science interfaced with ethnology and especially anthropology, which laid emphasis on techniques of measurement and classification.¹²² In the Peninsula, anxiety about the corrosive influence of development on the physical and cultural landscape fuelled efforts to survey, map, record, and catalogue information, including the collection and preservation of specimens and artefacts. The Cambridge-educated W. W. Skeat made a pioneer study of the aborigines of Ulu Langat and the customs and beliefs of the Malays, based on data he garnered during 1898-1900 as Assistant District Officer in Selangor and, later, District Magistrate in Perak.¹²³ The essence of his research informed

¹²¹ H. C. Robinson, *The Birds of the Malay Peninsula*, London: H. F. and G. Witherby, 1927, I, pp. xvi-xvii; Kathirithamby-Wells, *Nature and Nation*, pp. 193, 195.

¹²² When the Anthropological Society broke away from the Ethnological Society in 1863, ethnological questions 'were not so much rendered obsolete as subsumed by the new anthropology'. Bravo, 'Ethnological encounters,' in Jardine *et. al.* eds., *Cultures of Natural History*, p. 356.

¹²³ W. W. Skeat, and F. F. Laidlaw, 'The Cambridge University Expedition to parts of the Malay Peninsula 1899-1900', Introduced by C. A. Gibson-Hill, *JMBRAS*, 26, 4, 1953, p. 5.

two pioneer works: *Malay Magic* (1900) and *the Pagan Races of the Malay Peninsula* published with C.O. Blagden (1906).

Keen on providing a broader base for his ethnological interests, Skeat was quick to utilize the multi-disciplinary character of natural science, for which Cambridge had set a lead. Encouraged by the success of the Haddon Cambridge expedition to New Guinea, the Torres Straits and North Borneo, Skeat mounted in 1899-1900 an expedition to the rarely visited areas of the northern Malay states. A prominent member of the team was N. Annandale who had read natural science in Oxford and whose interests spanned anthropology and zoology.¹²⁴ R. Evans and F. F. Laidlaw, also with degrees in natural science from Oxford and Cambridge, respectively, joined the team and worked largely on zoology, while D. T. Gwynne-Vaughan applied himself specifically to botany. Integral to the success of the venture were the 11 local guides and assistants, 6 of whom were recruited through Skeat's contacts in Selangor.¹²⁵

The Skeat expedition covered Patani, the neighbouring Siamese districts including Kelantan, Terengganu and Kedah, as well as Upper Perak. Based on the zoological, botanical and ethnographical materials collected and since preserved in the museums of Cambridge University, were published some of the earliest scientific papers on the Peninsula. In addition, information in Skeat's diary about socio-political conditions in these remote areas may well have assisted administrators and scientists of the newly established Federated Malay States (FMS) (1896) and the northern Malay states, ceded in 1909 by Siam.¹²⁶ Ridley, for example, made a trip in 1910 to Kedah, Perlis and Setul 'to find out where the Malayan Flora ended and where the Siamese began'.¹²⁷

The general success of the Skeat Expedition provided the impetus for a second expedition, conducted during 1901-02 under the joint auspices of the Universities of Edinburgh and Liverpool and headed by Dr Annandale and Herbert Robinson. This expedition, again to the north, covered lower and central Perak, Selangor and the Siamese districts of Singgora, Patalung and Trang on the isthmus. A far more extensive report than that of the Cambridge

¹²⁴ Nelson Annandale held a research fellowship in anthropology in Edinburgh University (1902-4) and later became Deputy (1904) and then Superintendent (1907) of the Indian Museum, Calcutta. In 1916 he founded and headed the Indian Zoological Survey and, in 1923, was elected President of the Asiatic Society of Bengal. Skeat and Laidlaw, 'The Cambridge University Expedition,' p. 170.

¹²⁵ W.W. Skeat and F.F. Laidlaw, 'The Cambridge University Expedition,' pp. 170-2.

¹²⁶ The FMS constituted the sultanates of Selangor, Perak, Negeri Sembilan and Pahang, while the Unfederated Malay States comprised Kedah, Perlis, Kelantan, Terengganu and Johor.

¹²⁷ Ridley to Joseph Hooker, 24 March 1910, *Kew Bulletin* 1910, Misc. 56, RBGK, pp. 202-4.

Expedition was produced in *Fasciculi Malayenses* (1903-04) and included, in Parts I and II, Annandale's valuable report on anthropology. Significant was the participation of H. C. Robinson, a zoological assistant in the Liverpool Museum. Attracted by the prospect of studying the little-known fauna of the Peninsula, he assumed the post of Curator of the Selangor Museum at the end of the expedition (see below). Besides linking government scientific initiatives with British universities, the trail blazed by the university expeditions assisted later government surveys. The track up the mountain-side used by the Skeat venture that failed to reach Gunung Tahan, for example, later guided the Robinson expedition successfully to the peak.¹²⁸

Given that the collections of the Cambridge and Liverpool University expeditions were appropriated by their respective institutional museums, the acquisitions of local museums were sourced almost entirely from government-sponsored expeditions. The only exception was the private collections of Sultan Abu Bakar of Johor and the nascent Selangor Museum. The latter, inspired perhaps by Hugh Low's far-sighted government model in Perak, was set up by Selangor's naturalists and hunters for the display of personal collections. These modest beginnings laid the foundation for the Selangor State Museum, inaugurated in 1903. The following year it was incorporated within the Federated Malay States (FMS) Museums Service, with Leonard Wray as the first Director (1904-08).¹²⁹ Official sponsorship for identifying, mapping and cataloguing the fauna of a yet uncharted territory thereafter was channelled mainly through government museums.

While the Raffles Museum in Singapore, founded in 1849, was conceived as a general repository for all objects of historical value, the Selangor Museum became the main centre for all zoological reference collections, for which H. C. Robinson as Director of the FMS Museums (1908-26) laid the foundations. A dedicated zoologist and a man of extraordinary energy and wide-spanning interests, Robinson earned the distinction of being the first European to reach the summit of Gunung Tahan. With his Assistant, C.B. Kloss, he also conducted the pioneer exploration of the 1500m plateau of Cameron Highlands. Robinson subsequently took charge of hill development and organized the Malayan meteorological service, in addition to his task as Inspector of Fisheries.¹³⁰

Like Wray who had earlier supplied the Kew herbarium, Robinson shipped duplicate collections of FMS material to the Natural History Museum in London, the central repository for fauna in the empire. In 1926 the headquarters of the FMS/SS Museums moved to Singapore under

¹²⁸ Skeat and Laidlaw, *The Cambridge University Expedition*, p. 102 n.5., see below.

¹²⁹ Kathirithamby-Wells, *Nature and Nation*, pp. 168-9.

¹³⁰ Wells, *The Birds of the Thai Malay Peninsula*, p. 730; Kathirithamby-Wells, *Nature and Nation*, pp. 157-8.

Robinson's successor, Kloss (1926-31). The collections were reorganized at this stage, concentrating the vertebrate specimens in Singapore, while the bulk of the entomological material relevant to the interest of the Agricultural Department remained in Kuala Lumpur. The focus of the colonial museum on field collection was complemented by research in metropolitan institutions. Both were driven by the single aim of mapping the resources of the empire for the enhancement of material wealth and prestige. Set in parallel with metropolitan holdings that evoked pride of empire, the Federated Malay State Museums were intended to encapsulate the natural world as national heritage under the trusteeship of Britain. At the level of the individual Malay state, museums were designed to impress the local visitor and help strengthen the bond between ruler and ruled.

The colonial government's recognition of the indivisible link between natural history and the colonial economy was reflected in its sponsorship for learned journals, the earliest of which was the *Journal of the Straits Branch of the Royal Asiatic Society* (JSBRAS) launched in 1878, a year after the Society was founded. It was envisaged that the journal would provide a forum for the dissemination of Malayan research on natural history and geography to the benefit, above all, of capitalist enterprise.¹³¹ In reality, the journal covered a much wider spectrum of interests pursued by naturalists, ethnographers and anthropologists in the course of administrative, military and amateur excursions.¹³² Renamed the *Journal of the Malayan Branch of the Royal Asiatic Society* (JMBRAS) in 1923, the editorship held successively by Ridley (1890-1911), R. Hanitish (1912-13) and Kloss (1923-26), attested to the pre-eminence of naturalists in the early development of the Peninsula. Apart from the JSBRAS, the in-house museum journals served as important outlets for Malayan taxonomic studies. These included the *Federated Malay States Museums Journal* (1905) and the *Bulletin of the Raffles Museum* (1928), which later became the *Raffles Bulletin of Zoology*. In the post-World War II era JMBRAS addressed a wide audience, particularly during the editorship of the polymath, Carl A. Gibson-Hill (1948-61).¹³³ In the subsequent period, subscription to professional journals by scientists at the

¹³¹ JSBRAS, 1, 1878, p. 6; H.N. Ridley, 'The Scientific exploration of the Peninsula', JSBRAS, 75, 1917, pp. vii-xi. In 1923 the Malayan Branch of the Royal Asiatic Society (MBRAS) replaced the Straits Branch.

¹³² For a brief history of the journal see Tiew Wai Sin, 'History of the *Journal of the Malaysian Branch of the Royal Asiatic Society* (JMBRAS) 1878-1997: An Overview', *Malaysian Journal of Library & Information Science*, 3, 1, 1998, pp. 43-60.

¹³³ A medical doctor, zoologist and wildlife photographer, Gibson-Hill pursued his interest in natural history (particularly ornithology), as did a number of others interred in Changi jail during World War II. In 1947 he became Assistant Curator at Raffles Museum, then Curator and rose to be Director (1957-63). Wells, *The Birds of the Thai Malay Peninsula*, p. 734.

University of Malaya, established in Singapore in 1949, freed up *JMBRAS* for the humanities.

Scientific publications, both official and private, were the outcome of the close collaboration and the cross-disciplinary interests of individuals such as Wray, Robinson and I.H.N. Evans, ethnographer at the FMS Museums. The techniques of observation, measurement and classification employed by natural history were adopted by anthropology for understanding the natural world that shaped aboriginal life. Significant examples are: Annandale and Robinson's 'Semang and Sakai Tribes',¹³⁴ Robinson and Kloss's 'Additional notes on the Semang Paya of Ijok, Selama',¹³⁵ and Evans's *Negritos of Malaya*.¹³⁶

Robinson, in particular, had a profound influence on the development of natural history in the Peninsula. Apart from leading the first systematic taxonomic studies of fauna in the Peninsula, which were published in government journals, Robinson wrote the popular guide, *The Birds of the Malay Peninsula* (2 vols., 1927-28). This post-retirement undertaking was encouraged by the Colonial Secretary, W.G. Maxwell, a hunter-turned-wildlife enthusiast and author of the all-time classic, *In Malay Forests*.¹³⁷ It marked a significant transition from the era of natural history as a 'cabinet of curiosities' to the observation of life forms in the wild.

The Naturalist as Colonial Scientist and Conservationist. Changing attitudes to wildlife emanated largely from the influence of the Anglo-American wildlife protection movement that rapidly converted some of the most ardent hunters in the Peninsula to conservationists. The wildlife protection lobby was made up largely of rubber planters, with Theodore Hubback in the lead. Following the 1921/22 economic downturn when the non-revenue-yielding Museums Department receded into the shadows, the ex-hunters effectively shifted fauna studies from the museum to the field. Official interest in wildlife was strictly limited to the protection of agriculture against 'vermin', a situation that Hubback set out to change through the sheer strength of his personality and his influential connections abroad. Through his energetic lobbying, the FMS passed the '1921 Birds and Wildlife Protection Enactment'. Subsequently extended to the Unfederated Malay States (UFMS)

¹³⁴ N. Annandale and H.C. Robinson. 'Contributions to the Ethnography of the Malay Peninsula, Pt. 1, Semang and Sakai Tribes', in *Fasciculi Malayenses*, London: Longmans Green for University Press, Liverpool, 1903, p. 10.

¹³⁵ H. C. Robinson and C. B. Kloss, 'Additional Notes on the Semang Paya of Ijok, Selama, Perak', *Journal of the Federated Malay States Museums (JFMSM)*, 5, 4, 1915, pp. 187-213.

¹³⁶ I.A.H. Evans, *The Negritos of Malaya*, Cambridge: Cambridge University Press, 1915.

¹³⁷ W.G. Maxwell, *In Malay Forests*, First published in 1907; London; Singapore Eastern Universities Press, 1960; Wells, *The Birds of the Thai Malay Peninsula*, p. 730.

of Kedah, Kelantan, Terengganu and Johor, the enactment aimed at arresting the depletion and potential extinction of the rarer and more spectacular mammals such as the elephant, tapir, rhinoceros and gaur. Hubback also recruited the services of planters, namely, H.H. Banks, A.T. Edgar, V.W. Ryves, R.R. Hartley and K.P Reynolds as Honorary Game Wardens in their respective states of residence. Valuable observations relating to the sighting and behaviour of animals in the wild were published by Hubback, Banks and Ryves in *British Malaya*, the widely circulated magazine of the British Association of Malaya as well as the *Journal of the Society for the Preservation of Fauna of the Empire*.

Perhaps the greatest contribution to field science in the Peninsula was the creation, in 1939, of the King George V (Taman Negara) National Park, championed by Hubback with metropolitan backing. Its formation, following closely on the heels of India's Hailey (Corbett) (1936) and Ceylon's Wilpattu (1938) National Parks, placed the Peninsula firmly on the map of conservation science.¹³⁸

By the beginning of the twentieth century, the utilitarian ends of government-sponsored science privileged forestry over horticulture. Founded in 1901, the Forest Department successfully merged Kew's promotion of forest preservation for climate and species protection, with the imperative of wood for development in the FMS.¹³⁹ The support lent by the Governor/High Commissioner John Anderson for forestry and the rubber industry at the expense of botany earned Ridley's bitter criticism. He referred to the abolition in 1910 of the Melaka Botanic Gardens as a short-sighted move by 'our wretched barbarian governor' to save the expense of an assistant.¹⁴⁰ Anderson's strictly utilitarian bent of mind alienated him from the government scientific community as a whole. Opposed to purely scientific research, in 1904, he terminated the independence of the Institute of Medical Research (see below) and incorporated it within the Medical Department to concentrate research on human diseases.¹⁴¹

By the 1920s and 1930s, financial exigencies shifted the research focus from natural history centred in the Museums Department to applied biology for serving the Agriculture and Forest Departments. Nonetheless, natural history remained an important component of research in both departments, as also in the Singapore Botanic Gardens. In 1926, the Forest Research Institute (FRI) was established in Kepong and it soon set up its own herbarium in addition to that maintained by the Singapore Botanic Gardens. Though part of the Institute's holdings was looted in 1942 at the beginning of World War

¹³⁸ Kathirithamby-Wells, *Nature and Nation*, pp. 198-217.

¹³⁹ *Ibid.*, pp. 68-76.

¹⁴⁰ Ridley to J. Hooker, 24 March 1910, Miscellaneous, 56, RBGK.

¹⁴¹ Chai, *The Development of British Malaya*, p. 209.

II in 1942, the herbarium was rescued by Japanese scientists. Adopting an enlightened policy, the Marquis Yashichika Tokugawa as Supreme Advisor to the military government directed all museums, libraries and their contents to be preserved as national heritage.¹⁴²

FRI's first Research Officer, F. W. Foxworthy (1913-31), combined his training as botanist and wood technologist to pioneer research into economic forest produce. With the subsequent rise of the timber industry, attention was focused on *Dipterocarpus*, the defining family of the Malayan forest. Prior to the outbreak of war in 1941, the Forest Economist C. F. Symington completed the still-valued study, *Forester's Manual of Dipterocarps*. The manuscript—a hallmark of continued international scientific cooperation—was published in 1943 by Caxton Press, Kuala Lumpur, through collaboration between the Japanese forester, Tanakadate Hidezo, and British prisoners of war, headed by the eminent botanist, E. J. H. Corner. The work, providing the first comprehensive classification and description of the forest types of the Malay Peninsula, was widely accepted 'as the basis for Malaysian forest ecological research' and republished in 1974.¹⁴³

Another influential work was J. G. Watson's *Mangrove Forests of the Malay Peninsula* (1928), a pioneer study of mangrove ecology. Observational information about the wonders harboured by the mangroves was utilized by the English press to re-image the 'fever-haunted wastes' of these environments:

[T]hey... have flying fox...numerous birds, crabs, and those amphibious mudfish which, by reason of their habit of disporting themselves on mangrove roots, led a sensational American writer to describe Malaya as a country where 'fish climb trees'.¹⁴⁴

Despite the trend towards specialization, field studies and the multi-disciplinary approach of the naturalist continued to be crucial, as manifested in medical research. Malaria, which spread with extensive land clearance for rubber, reached an unprecedented level by 1910 when 81,294 cases were recorded.¹⁴⁵ The scourge of malaria and other tropical diseases in the British colonies galvanized metropolitan action, and the Royal Society's Malaria Committee was formed. Like Banks during an earlier era, Sir Patrick Mason as President of the Society was widely influential. When appointed Medical Advisor to the Colonial Office, he steered the Colonial Secretary Joseph

¹⁴² Kathirithamby-Wells, *Nature and Nation*, pp. 233-4.

¹⁴³ C. F. Symington, *Foresters' Manual of Dipterocarps*, First published in 1943, Malayan Forest Records, No.16 ; Kuala Lumpur: Penerbit Universiti Malaya, 1974.

¹⁴⁴ Kathirithamby-Wells, *Nature and Nation*, pp. 173-4.

¹⁴⁵ Chai, *The Development of British Malaya*, p. 222.

Chamberlain in the direction of an empire-wide policy for the eradication of tropical diseases, resulting in the historic founding in 1899 of the London School of Tropical Medicine. The Straits Settlements and the Malay States made a generous contribution towards its setting up and, in 1901, the generally parsimonious High Commissioner of the FMS, Sir Frank Swettenham (1901-4), loosened the government purse strings to inaugurate a corresponding local institution, the Institute for Medical Research (IMR).

In 1880, Alphonse Laveran, stationed with the French Army in Algeria discovered the malaria parasite in blood. In 1897, Dr Ronald Ross in India successfully tracked it down to the *Anopheles* mosquito. Credit for the practical application of Ross's knowledge went to Malcolm Watson of the Malayan Medical Service, based on work conducted as a hobby while stationed at Kelang, Selangor. A man very much in the mould of the nineteenth-century surgeon-naturalist, he perceived the key to malaria control to be observational knowledge of the vector species and its breeding habits, which he set out to investigate.¹⁴⁶ The prime breeding ground of the area was identified as a large swamp in the vicinity of a plantation settlement. After it was drained by the Sanitary Board malaria disappeared miraculously, providing Watson with a vital clue for formulating protection measures for the lowland estates. The forests were felled and the pools drained within a half-mile radius of settlements, beyond which the mosquito of this particular habitat (later identified as *Anopheles umbrosus*) could not fly.¹⁴⁷

Watson's groundbreaking achievement notwithstanding, the prevailing trend for the separation of clinical service from medical research forced his resignation in 1907, ending the long tradition of the surgeon-naturalist. Watson's subsequent research into malaria, supported by the rubber industry, focused on the ineffectiveness of his formula for the control of *Anopheles maculatus*, which unlike *Anopheles umbrosus*, thrived in cleared areas and bred in clear, running water. To contend with the problem, Watson conceived the idea of subsoil drainage and, by 1918, the disease was brought under control.¹⁴⁸ Against the initial skepticism of many doctors and scientists, he successfully interpreted the complex inter-relation between the tropical vector and topography, climate and population.¹⁴⁹ His ground-breaking research in malaria control placed the Peninsula in the forefront of tropical medicine and the related plantation industry.

¹⁴⁶ Institute of Medical Research (IMR), *Medical Trends: Institute for Medical Research, 1900-1950*, Jubilee Volume: Studies from the Institute for Medical Research, Federation of Malaya, No. 25, Kuala Lumpur, 1951, p. 161.

¹⁴⁷ M. Watson, *Rural Sanitation in the Tropics*, London: Murray, 1915, p. 12; Chai, *The Development of British Malaya*, pp. 216-20.

¹⁴⁸ IMR, *Medical Trends*, p. 160; Watson, *Rural Sanitation in the Tropics*, pp. 13-16.

¹⁴⁹ IMR, *Medical Trends*, p. 173.

Natural history remained relevant to the rubber industry in other respects as well. Before the founding in 1926 of the Rubber Research Institute of Malaya (RRIM), plantations relied on the experience and empirical observations of their own managerial staff for scientific expertise. By the 1920s, based purely on the observed benefits of vegetation cover, some plantations combined the use of legumes as cover crops with indigenous practices of terracing to combat soil degradation.¹⁵⁰ Though the majority of plantations continued with clean weeding, by 1933 RRIM had marshalled sufficient evidence, based on smallholder practices, about the benefits of reduced weeding without the previously-feared risk of 'mouldy rot disease'.¹⁵¹ The Peninsula again took the lead in combating the problem of tropical soil erosion, addressed only some years later by the home government in the *Rape of the Earth: A World Survey of Soil Erosion*.¹⁵²

By the 1930s, natural history was securely embedded in the new science of ecology based on scientific collaboration. The understanding of nature and environment as an organic whole bred greater cooperation among scientists of specialist departments towards pursuing solutions for interrelated problems. Thus, the IMR, previously biased towards pathology, made room for entomology to investigate scrub typhus. Caused by the pathogen *Rickettsia tsutsugamushi*, transmitted by rats, the disease proliferated with the introduction of oil palm.¹⁵³

In another sphere, the forester-turned-ecologist, J.N. Oliphant, advocated landscape preservation to control erosion.¹⁵⁴ His concern over hill erosion, like that of J.R. Logan more than a century earlier, was based on first-hand observation of ecological processes in the tropics. It was the input of naturalists such as these that shaped metropolitan policy. By 1939, the Imperial Bureau of Soil Science at Rothamsted, Kent, envisaged the plant ecologist working with the animal ecologist and the population expert for re-vegetating denuded tropical landscapes.¹⁵⁵

¹⁵⁰ A. W. King, 'Plantation and Agriculture in Malaya, with Notes on the Trade of Singapore', *Geographical Journal*, 93, 1, 1939, p. 139.

¹⁵¹ *Malay Mail*, 19 June 1933; W. B. Haines, *The Uses and Control of Natural Undergrowth*, First published in 1934; Kuala Lumpur: Rubber Research Institute of Malaya (RRIM), 1940, p. 39; Kathirithamby-Wells, *Nature and Nation*, pp. 177-8, 186 n. 88.

¹⁵² G. V. Jacks and R. O. Whyte, *Rape of the Earth: A World Survey of Soil Erosion*, London: Faber & Faber, 1939.

¹⁵³ IMR, *Medical Trends*, pp. 189-94.

¹⁵⁴ J. N. Oliphant, 'Save the Vegetation', *Malayan Forester*, 4, 1935, pp. 3-7.

¹⁵⁵ Kathirithamby-Wells, *Nature and Nation*, pp. 174-5; 280-1.

Conclusion

The foundations for mapping and understanding the Malaysian environment in modern terms is traceable to the Enlightenment, manifested in the progress of natural history as an arm of European expansion and imperialism. It was nonetheless played out as a collaborative enterprise between European and indigenous participants. Though, by and large, the development of biological science was Europe-centred, tropical biology was synonymous with field science in the colonies. The achievements of natural history in the peripheries of empire stimulated the two-way flow of knowledge and information via far-flung information networks, broadening and supporting metropolitan science. Natural history arguably served the purposes of imperial power and prestige but simultaneously helped built an invaluable trans-regional scientific legacy and database.

The new nation states of the post-World War II era have viewed natural history and the institutions it spawned as part of a colonial past, bearing little or no relevance to the immediate interests of state-building. Moreover, the goal of industrialization has favoured the mathematical and experimental sciences, marginalizing the biological sciences.¹⁵⁶ Museums and natural history collections have served largely the purpose of public displays. However, the 1992 Earth Summit at Rio de Janeiro, which sparked a profound change in attitudes world-wide, influenced the new direction of policy in Malaysia. Its *Country Study on Biological Diversity* (1997), in compliance with the 1992 United Nations Convention on Biological Diversity (CBD), draws attention to the need to reinstate natural history as an integral part of heritage. Core recommendations of the study resonate with the fundamental principles enshrined in natural history, namely ‘monitoring through non-destructive sampling’ for the purpose of inventorying and taxonomic research.¹⁵⁷

As in the past, official sponsorship for biological research and exploration continues to be motivated primarily by utilitarian aims. These are currently, biotechnology, tourism and the benefits of intellectual property rights. Yet, on another level, education and changing life styles among the expanding middle-class have fostered the aesthetic and inquiring spirit associated with social progress. Shanon Ahmad, the Malay literary figure and social commentator has drawn attention to the irrevocable link between Malaysia’s natural heritage and the material and moral well-being of its

¹⁵⁶ Jardine *et. al.* eds., *Cultures of Natural History*, p. 3.

¹⁵⁷ Ministry of Science, Technology and Environment (MOSTE), *Assessment of Biological Diversity in Malaysia*, Kuala Lumpur, 1997, p. 151.

people.¹⁵⁸ Natural history has assumed fresh relevance in the context of changing perceptions of the environment within the broadening middle class and underpins current international concern over climate change and related forest loss.

Subscription to the cause of environmental conservation in the Peninsula has increased over the past few decades as has the number of amateur naturalists. These have swapped the trophy-hunter's gun for state-of-the-art digital cameras and sophisticated optics to capture the images and processes of nature. The speed of information exchange among amateur naturalists via fast-track internet corridors is matched by the ease of access to places, assisted by improved mapping, transportation and tourism. These changes contribute to closing the divide between the averred Orientalism of colonial science and the development-linked global science of the post-World War II era.

Natural history, once an emblem of colonial pride and power and now directly relevant to the concerns of tourism and sustainable development, continues to retain its dual persona as an economic and cultural artefact. It merits an integral place in the historiography of post-colonial nation states like Malaysia, which have experienced in the last century some of the most profound and dramatic environmental changes in human history.

¹⁵⁸ Shahnon Ahmad, *Kesasterawanan: Kepolitikan, Kealaman, Kediriian, Kemanusiaan [Literary Writers, Politics, Environment, Self-Reliance and Humanity]*, Kuala Lumpur: Dewan Bahasa dan Pustaka, 1992, pp. 84-5.