

Tropical medicine in nineteenth-century India†

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INTRODUCTION

It is customary to regard ‘tropical medicine’ as a product of the late nineteenth century, ‘its instrument the microscope, its epistemology the germ theory of disease’. The accepted interpretation is that tropical medicine was a European concept: originating in Britain and France and exported to the colonies by pioneering medical scientists.¹ This interpretation is useful inasmuch as ‘tropical medicine’ as a discipline with its own journals, institutions, qualifications, and an exclusive discourse did not emerge until the last decade of the nineteenth century, and partly in response to metropolitan imperatives.² But the European perspective of existing histories of ‘tropical medicine’ has obscured important developments in the understanding of diseases in the tropics which took place prior to 1890; most of which occurred in the colonies themselves – and especially in India. In order to distinguish this body of knowledge from its later, institutional incarnation, it will be referred to here as ‘tropical hygiene’: the term most commonly used by medical men in India until the 1890s.³

The first attempt to view tropical medicine in relation to political and social developments was made by Worboys in 1979. Critical of ‘Whiggish doctor historians’, whose triumphalist accounts of tropical medicine were entirely divorced from their social context, Worboys argued that the formation of the discipline was not simply a function of specialization in medical knowledge, but largely a consequence of the activities of medical men who identified their own objectives with those of commercial and political groupings interested in colonial development. Joseph Chamberlain, who became Colonial Secretary in 1895, saw the conquest of tropical disease as central to his policy of ‘constructive imperialism’, and was instrumental in setting up the first institutions specializing in

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1 R. M. MacLeod, ‘Introduction’, *Disease, Medicine, and Empire. Perspectives on Western Medicine and the Experience of European Expansion* (ed. R. M. MacLeod and M. Lewis), London, 1988, 7.

2 Sir Patrick Manson and others held that ‘tropical medicine’ came into being with Laveran’s identification of the parasite causing malaria. See Manson, ‘Address to BMA tropical diseases section’, *Journal of Tropical Medicine* (hereafter *JTM*) (Aug. 1898), 22; *JTM* (Feb. 1906), 38, editorial.

3 The current tendency is to view ‘tropical disease’ as an artificial categorization, imposed by colonial medical men on diseases which, in reality, bear more relation to poverty than to geographical location. See, for example, K. D. Patterson, *Health in Colonial Ghana: Disease, Medicine and Socio-Economic Change, 1900–1955*, Waltham, Mass., 1981.

‘tropical medicine’: the London and Liverpool Schools of Tropical Medicine established in 1899.⁴

Worboys’ contextualization of tropical medicine has much to recommend it, but it inadvertently sustains the ‘heroic myth’ spun by the ‘pioneers’ of tropical medicine: that no significant contribution had been made to the understanding of diseases in the tropics prior to their arrival on the scene.⁵ Worboys acknowledges that ‘the problem of tropical disease’ pre-dated the emergence of tropical medicine as a discipline but maintains that:

the contribution of the British presence in India to the treatment and understanding of tropical disease was surprisingly meagre, certainly until this century...The IMS had no record of achievement in the study, treatment or prevention of tropical diseases in the nineteenth century or before.⁶

He concludes that tropical medicine was typical of ‘colonial science’ in that it was an ‘applied’ science, dependent upon metropolitan ‘pure’ science.⁷

But rather than being typical of ‘colonial science’, tropical medicine may constitute something of an exception: the greater sensitivity of medicine to social context meant that it was more likely to be adapted in the light of colonial experience than other branches of science.⁸ It is argued below that medical men in India began to criticize widely-held medical opinions in Europe on the basis of their experience of ‘new’ diseases in the tropics and of the environmental conditions thought to be responsible for their propagation. What impressed them most was the seemingly law-like behaviour of the Indian climate and its apparent bearing on the incidence of diseases like cholera and malaria. As cholera began to ravage Europe for the first time in 1830, the opinions of Indian medical men were increasingly sought after, and their views of disease causation and prevention – which were sometimes derived from indigenous Indian medical knowledge – began to make an impression on British medicine. These contributions provide evidence that ‘colonial science’ was not necessarily ‘dependent’ science, derivative of metropolitan models. However, Worboys’ remarks have greater relevance for the period 1860–80, when the Indian Medical Service (IMS) resisted certain medical ideas then fashionable in Britain. Yet the continuing distinctiveness of colonial medical knowledge in India until the close of the

4 Worboys, ‘Science and British Colonial Imperialism, 1895–1940’ (University of Sussex D.Phil. thesis, 1979), 83–128; Worboys, ‘The emergence of tropical medicine: a study in the establishment of a scientific speciality’, in *Perspectives on the Emergence of Scientific Disciplines* (ed. G. Lemaine et al., The Hague, 1976, 76–98; Worboys, ‘Manson, Ross, and colonial medical policy: tropical medicine in London and Liverpool, 1899–1914’, in MacLeod and Lewis, op. cit. (1), 21–37.

5 For example: H. H. Scott, *A History of Tropical Medicine*, London, 1939–42; P. E. C. Manson-Bahr, *Patrick Manson: the Founder of Tropical Medicine*, London, 1962.

6 Worboys, ‘British colonial imperialism’, op. cit. (4), 85–7.

7 *Ibid.*, 414. A similar argument is advanced by R. Macleod in ‘Scientific advice for British India: imperial perception and administrative goals, 1898–1923’, *Modern Asian Studies* (1975), 9, 343–84.

8 Grove makes a similar case for botany in India prior to 1857: see R. Grove ‘Conservation and Colonial Expansion: A Study of the Evolution of Environmental Attitudes and Conservation Policies on St. Helena, Mauritius, and in India, 1660–1860’ (University of Cambridge Ph.D. thesis, 1988). Geology in early and mid-nineteenth-century India, however, provides a classic instance of a science directed almost entirely from the metropolis. See R. A. Stafford, *The Empire of Science: Sir Roderick Murchison, Scientific Exploration and Victorian Imperialism*, Cambridge, 1989.

nineteenth century provides further proof of its independence of metropolitan scientific authority.

But medical practice in India after 1860 was not completely impervious to developments taking place in Europe, and, despite considerable resistance in some quarters, was slowly modified in response to new ideas of disease causation which stressed the role of specific disease agents as opposed to general environment causes. Perhaps more important were new configurations in the cultural and political relationship of Europeans to indigenous peoples. Tropical hygiene reflected and itself shaped changing European perceptions of the Indian people, their culture, and the Indian environment. As tropical hygiene grew more distant from its origins in the late-eighteenth-century Enlightenment, it re-cast India and its people in an unfavourable light, and ceased to display any interest in indigenous notions of disease prevention. Increasingly, the Indian environment was portrayed as intrinsically pathogenic and its indigenous inhabitants as reservoirs of dirt and disease.

Prior to 1830, European medical men in India demonstrated an intellectual breadth and receptiveness characteristic of the late Enlightenment. Their willingness to assimilate new developments in European science and the more learned aspects of indigenous culture had a profound effect upon the way in which Europeans came to view the Indian environment, and upon colonial, and subsequently metropolitan medical knowledge. A notable characteristic of the East India Company (EIC) surgeon in this period was his Scottish medical training: the majority of recruits prior to 1860 had attended Edinburgh University. Edinburgh was the cradle of the Scottish Enlightenment, and the cosmopolitan purview of the Wernerian Natural History Society and the *Edinburgh Philosophical Journal* sustained interest in developments on the Continent well into the nineteenth century. Particularly important were the close connections that existed between Edinburgh medical men and other scions of the Enlightenment in Germany and France. Cultural interaction was further stimulated by the postgraduate training received by many Scottish medical men in European and especially German universities, and the recruitment of German and Scottish men to the medical service of the EIC. The result was an extraordinarily fertile period of cultural and scientific interchange: a blending of French physiocracy, German *Naturphilosophie*, and the open-minded, experimental approach to medicine characteristic of Edinburgh medical training.⁹

EIC surgeons at this time embodied the 'Burkean' ethos of the Company's administration: there was a general feeling that Indian culture was deserving of respect and that the subcontinent should be governed in accordance with its traditions. The Burkean view of Indian culture stemmed from a distrust of radical change and from more general notions of equality and tolerance characteristic of the Enlightenment.¹⁰ One feature of the Enlightenment spirit was the willingness of European medical men to learn from

⁹ Grove, *op. cit.* (8), 186–7, 262, 291; A. C. Chitinis, *The Scottish Enlightenment, a Social History*, London, 1976, 124–87; J. C. Riley, 'The medicine of the environment in eighteenth century Germany', *Clio Medica* (1983), 18, 167–78.

¹⁰ For a discussion of Burkean philosophy and Company administration see G. D. Bearce, *British Attitudes Towards India, 1784–1858*, London, 1982, 14–33. Respect for indigenous cultures, however, was by no means a universal feature of the 'Enlightenment' as a whole. Turgot and Smith, for example, viewed most indigenous

indigenous systems of medicine. In his *Adversariorum Varri Argumenti* (1771) the widely respected Dutch physician Jerome Gaub advised medical men leaving for the Indies to employ only local remedies in the treatment of disease. In his capacity of Professor of Medicine and Chemistry at the University of Leiden, Gaub had himself conducted observations into the medicinal properties of East Indian roots.¹¹ EIC surgeons carried out many similar investigations and compiled numerous pharmacopoeia of indigenous remedies; one of the best known is George Playfair's *Taleef Shereef* (1832). Outside the medical profession, the antiquarian and eminent Sanskrit scholar William Jones drew attention to traditional medicine and to the curative properties of Indian herbs and drugs.¹² Interest in indigenous medicine was just one aspect of a widespread fascination with all aspects of Indian culture. Company surgeons wrote many non-medical texts, or treatises which had only an indirect bearing on medicine. Among the best known are William Roxburgh's *Flora Indica* (1820) and John Leyden's *Dissertation on the Languages and Literature of Indo-Chinese Nations*, which passed through several editions around the turn of the century.

Respect for indigenous medicine reflected its epistemological similarities to European medicine at this time. Until the mid-nineteenth century, western and Hindu (*ayurvedic*) medical texts, like the *Charaka Samhita* and the *Susruta Samhita* had much in common regarding basic etiological principles. Both systems stressed the importance of general environmental factors like climate in disease causation. *Ayurveda*, like western medicine, held that the 'exciting causes' of fever were most commonly meteorological and geographical disturbances. Man was viewed as part of nature, a microcosm of the universe, comprised of like matter (*rasa*) existing in five forms: earth, water, fire, air, and sky. Diagnosis of the patient involved a process known as *bhumi-pariksa*: examination of the patient in relation to his surroundings. In treatment, *ayurveda* and *unani* (Islamic medicine), like western systems, attached great importance to the regulation of diet, sleep, movement and other bodily functions. Indeed, *unani* and western medicine had common roots in ancient Greek medicine.¹³ In Britain it is possible to trace the lineage of this 'environmentalist' tradition through Galen to the eighteenth-century physician William

societies as being in a state of barbarism compared with European society, while Rousseau and Herder were far more critical of the idea of history as progress. See R. L. Meeke, *Social Science and the Ignoble Savage*, Cambridge, 1976.

11 L. J. Rather, *Mind and Body in Eighteenth Century Medicine. A Study Based on Jerome Gaub's 'De Regimine Mentis'*, Berkeley, 1965.

12 G. Playfair, *Taleef Shereef*, Calcutta, 1832. It appears to have been common practice for medical men, prior to the 1830s, to discard western therapeutic practices in favour of indigenous remedies. T. J. S. Patterson, 'The relationship of Indian and European practitioners of medicine from the sixteenth century', in *Studies in Indian Medical History* (ed. G. J. Meulenbeld and D. D. Wujastyk), Groningen, 1987, 119–29; Patterson, 'Science and medicine in India', in *Information Sources in the History of Science and Medicine* (ed. P. Corsi and P. Weindling), London, 1983, 457–75. For a comparison with the experiences of Portuguese medical men in Brazil see R. dos Santos Pereira, *Piso e a Medicina Indigena*, Pernambuco, 1980.

13 O. P. Jaggi, *Indian System of Medicine*, Delhi, 1973, 118–21; A. L. Basham, 'The practice of medicine in ancient and medieval India' and J. C. Burgel, 'Secular and religious features of medieval Arabic medicine', both in *Asian Medical Systems: A Comparative Study* (ed. C. Leslie), Berkeley, 1976, 18–43 and 44–59 respectively; P. Bala, 'State and Indigenous Medicine in Nineteenth- and Twentieth-Century Bengal: 1800–1947' (Edinburgh University Ph.D. thesis, 1987), 27–9.

Cullen, whose *Treatise on Fever* still dominated British medical curricula in the early 1800s.¹⁴ However, it is important not to overstate the degree to which Europeans were sympathetic to indigenous culture. Orientalism needs to be placed within the wider context of European domination, and Indian culture was respected for what it had once been, rather than for what it had become.

An awareness of Indian notions of disease causation is evident in the writing of Charles Maclean: the EIC surgeon sometimes credited with the introduction of ‘anticontagionist’ ideas of disease causation into Britain. Maclean’s primary concern was to show that the doctrine of person-to-person contagion – then the most common explanation of epidemic disease in Europe – had little basis in medical fact. ‘Contagionism’, he believed, had always been nothing more than a political expedient, of comparatively recent origin, and was by no means universally held:

The doctrine of contagion, as the cause of epidemic diseases was unknown to the ancient physicians, by whom these maladies were expressly attributed to air; as well as that the opinion never entered into the popular superstitions of any Pagan, Mohammedan, or Hindu nation; nor into those of Christian communities until about the middle of the sixteenth century, when it was first promulgated among them for a political purpose, by the head of the Christian Church.¹⁵

From his references to ‘popular superstitions’, it is clear that Maclean did not place Hindu or Islamic culture on an equal footing with that of the west. Nevertheless, drawing on his experiences in India and in the Levant, Maclean recognized that the absence of any doctrine of contagion among indigenous peoples had spared them the mortality suffered by the Christian population, who had prevented population movement away from the ‘infected area’ by placing suspects in *lazarettos* and by imposing *cordons sanitaires*.¹⁶ Maclean inveighed against ‘prejudice’ in several walks of life, and was expelled from India in 1798 by Governor-General Wellesley for making insinuations about corruption in the magistracy. On returning to Britain, Maclean secured a post on the hospital staff of the British Army, but his medical theories found little favour with the military medical authorities and his promotion was barred. Maclean left the service in 1806 and became a bitter and vocal critic of the Tory government and the Indian Governor-General.

However, Maclean was not critical of the EIC itself, becoming its lecturer in the diseases of hot climates and defending it against the government’s plans to end its monopoly of trade with India.¹⁷ Neither can Maclean’s ‘anticontagionist’ stance be attributed chiefly to

14 M. Pelling, *Cholera, Fever and English Medicine 1825–1865*, Oxford, 1978, 15–16. Cullen, however, was critical of Galen’s fluidist pathology, stressing instead the importance of the nervous system in the maintenance of physical and mental health. See I. A. Bowman, ‘William Cullen (1710–90) and the Primacy of the Nervous System’ (Indiana University Ph.D. thesis, 1975).

15 C. Maclean, *Results of an Investigation Respecting Epidemic and Pestilential Diseases; Including Researches in the Levant Concerning the Plague*, London, 1817, i, 4–5. On the advice of the orientalist William Jones, the EIC’s Court of Directors came to recommend that its surgeons make a study of indigenous medicinal herbs and drugs, and suggested that they would benefit from a closer association with indigenous practitioners. These convictions led to the establishment in 1822 of a Native Medical Institution in Calcutta, for the instruction of Indians (in their vernacular languages) in indigenous and western medicine. See Bala, *op. cit.* (13), 6, 70.

16 Maclean, *op. cit.* (15), 11, 21.

17 *DNB*. Charles Maclean (1788–1824), began his medical career as a surgeon on an East-Indiaman. In 1792 he settled in Bengal, taking charge of a hospital in Calcutta.

his political ‘radicalism’ or to the treatment he received in India at the hands of Wellesley.¹⁸ Though Maclean attacked the Tory government and Wellesley, and counted Whig politicians among his friends, he did not belong to any identifiable political circle. More importantly, his first treatise on disease theory – his *Dissertation on the Source of Epidemic Diseases* – was published in 1796: two years before he fell foul of the Indian authorities. Maclean’s medical views were more a product of his experience of the Indian disease environment, than of the repression he endured at the hands of Wellesley and the Tory government. His theory of disease causation was similar to those already published by other naval surgeons who had come into contact with ‘new’ diseases and climates in India and the West Indies.¹⁹ However, Maclean’s medical views and his criticisms of government did ingratiate him with Benthamite reformers like Southwood Smith and were reported in the *Whig Westminster Review*.

James Johnson – the most influential British writer on diseases of tropical climates in the first half of the nineteenth century – had no apparent connection with political radicalism. Indeed, in many respects, Johnson was an ‘establishment’ figure, being surgeon to the Duke of Clarence and editor of the *Medico-Chirurgical Journal*.²⁰ However, Johnson did conceive of himself as a reformer – if not a radical – in medical terms: an independent spirit who refused to bow to the dogmas of the past. He also had some sympathy with rationalistic doctrines like phrenology – then associated with middle-class radicalism – though he distanced himself from any charge of materialism, referring constantly to the importance of the human ‘spirit’ and to the benevolence of the Creator.²¹

Like Maclean, Johnson placed more value on observation than speculation in medical matters. His approach was inductive and comparative, drawing on the experience he had gained on several naval expeditions and from his time in India. According to Johnson, it was this experience that gave him the right to challenge the doctrines of the past. He acknowledged debts to writers like James Lind, who had gained medical experience in the tropics, but was sharply critical of others, like the Edinburgh physician John Brown, who had pronounced on the subject without direct knowledge of the Indian disease

18 This is the argument of Roger Cooter: ‘Anticontagionism and history’s medical record’, in *The Problem of Medical Knowledge*, Edinburgh, 1982 (ed. P. Wright and A. Treacher), 96–7. In a general sense, he suggests that there was a connection between anti-contagionism and political radicalism, ‘anti-contagionism’ offering a kind of ‘un-fixing solvent’ in which traditional ideas were dissolved.

19 For example James Lind, *Essays on the Diseases Incidental to Europeans in Hot Climates*, 1st edn, London, 1768. The publication date of this treatise suggests that it is misleading to credit Maclean, solely, with the introduction of ‘anti-contagionist’ theory into Britain.

20 DNB. James Johnson (1777–1845), born co. Derry, Ireland. At the age of fifteen became apprenticed to a surgeon-apothecary in co. Antrim, where he resided for two years. After spending a further two years at Belfast, he moved to London to study for the surgeon’s examination, which he passed in 1798. Immediately afterwards, Johnson was appointed surgeon’s mate on a naval vessel, and sailed to Newfoundland and Nova Scotia. In 1800 he took part in an expedition to Egypt and, in 1803, sailed for India. Johnson returned to England in 1806, where he continued to serve in the Royal Navy until setting up in private practice in 1814.

21 J. Johnson, *The Economy of Health or the Stream of Human Life from the Cradle to the Grave, with Reflections Moral, Physical and Philosophical on the Successive Phases of Human Existence, the Maladies to which They are Subjected, and the Dangers that may be Averted*, 2nd edn, London, 1837, 81, 119. For a discussion of phrenology as a vehicle of liberal/radical ideology see R. Cooter, *The Cultural Meaning of Popular Science. Phrenology and the Organisation of Consent in Nineteenth-Century Britain*, Cambridge, 1984.

environment.²² The surgeons who entered colonial or naval service in the late eighteenth and early nineteenth centuries were often men of independent spirit, spurred as much by intellectual curiosity and a quest for glory as by the lack of opportunities at home. This was true of French and German, as well as of British, medical men. In 1850, the idea of medical service in India was still sufficiently attractive to capture the interest of the young Baron Georg von Liebig (son of the renowned German chemist, Justus von Liebig), who remained in India for some years, becoming Professor of Natural History at the Hindu College, Calcutta.²³

The impression made by the tropical environment on the European mind cannot be overstated: the fecundity of nature might induce visions of paradise, but also of hell:

there all nature seemed to be at enmity with man. They were prevented from walking in the woods by tygers...and if by going armed or in small parties, they should escape these,...they were exposed to the views of venomous serpents...the shores of the river swarmed with crocodiles: the earth had its white ants, the air its wild bees, its sand-flies, its mosquitoes.²⁴

Such impressions, sometimes filtered through indigenous culture, fostered or compounded prevalent notions of environmental determinism in health and human characteristics. According to Lind, from whom Johnson drew a good deal, it was 'upon the soil, the temperature of the climate, [that] the colour, strength, and activity and health of the inhabitants greatly depend'.²⁵ Johnson's own work took into account a variety of environmental influences upon health. These influences differed from those operating upon the body in Europe in degree rather than in kind, but the degree was sometimes so significant that the malady produced was almost exclusively confined to tropical or torrid regions of the Earth. Even ubiquitous diseases like continued fever and cholera were thought to behave differently in the tropics, or required different forms of treatment there from in Europe.²⁶

Johnson held that most fevers were caused either by putrefaction or, more commonly, by variations in atmospheric temperature. The basis for this supposition was that:

every species of substance, whether animal, vegetable, or mineral,... which is capable of being dissolved by water, consumed by fire, or vitalized by heat, is diffused in endless variety and proportion through the different strata of the air. When therefore we consider that... this fluid is applied to... the most delicate blood vessels in the lungs, we cannot but conclude that its ever waning properties... must have a predominant influence on the health of the human race... So it

22 J. Johnson, *The Influence of Tropical Climates, More Especially of the Climate of India, on European Constitutions; and the Principal Effects and Diseases thereby Induced, their Prevention and Removal, and the Means of Preserving Health in Hot Climates Rendered Obvious to Europeans of Every Capacity*, 2nd edn, London, 1815, pp. ix, 27, 398–400.

23 W. Ernst, 'Doctor-patient relationship in colonial India: a case of "intellectual insanity"', *History of Psychiatry* (1990), 1, 207–22; Y. Laissus, 'Les voyageurs naturalistes du Jardin du Roi et du Museum d'Histoire naturelle: essai de portrait-robot', *Rev. Hist. Sci.* (1981), 34, 259–317.

24 J. Lind, *Diseases Incidental to Europeans*, 6th edn, 1808, 44.

25 *Ibid.*, 226. Lind went on to comment that negro slaves taken from the African coast were 'dull and stupid, lively and ingenious, sickly or robust, long or short-lived, according to the nature of the soil in the country from where they are brought'.

26 Johnson, *op. cit.* (22), 401; Johnson, *A Practical Treatise on Derangements of the Liver, Digestive Organs and Nervous System to which is added an Essay on the Prolongation of Life and Conservation of Health*, London, 1818, 11.

is to *sudden* changes in the temperature, and occasional impregnations of the atmosphere, that nine-tenths of its injurious effects on the human constitution are attributed.²⁷

There was nothing strikingly new in this idea, but Johnson's own experience of tropical countries had confirmed for him the conclusions of Cullen and Lind.²⁸ This experience – which often placed EIC surgeons at variance with their metropolitan colleagues – could be direct and personal, or mediated through indigenous culture:

However sceptical professional men in Europe may be, in regard to planetary influence in fevers, etc., it is too plainly perceptible between the tropics, to admit of a doubt. I have not only observed it in others, but felt it in my own person in India, when labouring under the effects of obstructed liver.²⁹

It is an observation of the natives on the coast of Coromandel, which is confirmed by the experience of many Europeans, that the longer the hot winds blow, the healthier are the ensuing months; these winds, as they express it, purifying the air.³⁰

One area in which Johnson differed significantly from his predecessors was in his estimation of the suitability of the European constitution to life in hot regions. Some years earlier Lind had been sanguine about the prospects for European settlement in the tropics:

By length of time, the constitution of Europeans becomes seasoned to the East and West Indian climates, if it is not injured by repeated attacks of sickness, upon their first arrival. Europeans, when thus habituated, are generally subject to as few diseases abroad, as those who reside at home.³¹

Johnson, however, believed that man was more indebted to the ingenuity of his mind than to the adaptability of his body:

the tender frame of man is incapable of sustaining that degree of exposure to the whole range of causes and effects incident to, or arising from vicissitudes of climate, which so speedily operates a change in the structure, or, at least, the exterior of unprotected animals.

Accordingly, there was little prospect of Europeans colonizing the tropics as they had North America and Australasia. Europeans in India, wrote Johnson, tended to 'droop' and, before long, to seek refuge in their native climate. The successive generations of those who remained in India, he believed, would 'gradually degenerate', morally and physically.³² Racial categorization, by the time of Johnson's writing, had hardened alongside other forms of classification: the distinctiveness of natural phenomena was emphasized as much as their interdependence. In Johnson's view, humankind could not

27 Johnson, *Derangements of the Liver*, op. cit. (26), 3–4.

28 Like most other practitioners at this time, Johnson accepted classification of fevers into 'remittent', 'intermittent' and 'continued': W. F. Bynum, 'Cullen and the study of fevers in Britain, 1760–1820', in *Theories of Fever from Antiquity to the Enlightenment, Med. Hist. Suppl.* (ed. W. F. Bynum and V. Nutton) London, 1981, 135–45.

29 Johnson, op. cit. (22), 88. The notion of lunar influence in fevers was a well-established one among medical men in India. See F. Balfour, *Treatise on the Influence of the Moon in Fevers*, Calcutta, 1784. Balfour believed that lunar influence on disease was universal, but that it showed itself in the tropics in an 'uncommon degree' (p. vi).

30 Lind, op. cit. (24), 155.

31 *Ibid.*, 171–2.

32 Johnson, op. cit. (22), 2–3.

trace its ancestry back to a single progenitor, each race being distinct and uniquely adapted to the circumstances of its environment.³³

Nevertheless, there was much that could be done to mitigate the effects of climate on European constitutions. In recommending his own prophylaxis and therapeutics, Johnson drew selectively but heavily upon Indian hygienic practices. His attitude towards Indian culture was ambivalent, showing respect for ancient traditions, but contempt for the way in which they had degenerated. In this residue of ancient learning, this 'strange medley of ludicrous and ridiculous customs', the discriminating European might discern some useful knowledge.³⁴ One important area in which Europeans might learn from Indians was that of dress. Johnson noted the benefits of the turban – as a protective against the sun – and the cummerbund – as a protective against chill – and advocated the wearing of analogous clothing by Europeans.³⁵ Johnson also drew attention to the inappropriate eating habits of Europeans in the tropics, and felt that Indian dietary regimes were worthy of consideration:

From indigenous customs, then, in respect to animal and vegetable food, we can draw no inference that absolutely prohibits [the eating of animal flesh]...but enough to convince us, that during the first years of our sojourn between the tropics, we should lean toward the Hindoo model; and as the tone of the constitution becomes lowered, or assimilated, we may safely adopt the Mahomedan manners.³⁶

Vigorous exercise was another of 'the luxuries of a northern climate, to which we must, in a great measure, bid adieu, between the tropics'. In Johnson's opinion, exercise exacerbated the debilitating effects of the tropical climate by sapping vital energy. Again there was much, with regard to physical exertion, that might be learnt from the habits of indigenous Indians:

The peaceful Hindoo retires, as it were instinctively, to the innermost apartment of his humble shed, where both light and heat are excluded. There he sits quietly...regaling himself with cold water or sherbert, while a mild, but pretty copious perspiration, flows from every pore, and contributes powerfully to his refrigeration.³⁷

Johnson's work was highly respected by his contemporaries in Britain and in India, and his *Influence of Tropical Climates* went through six editions, the last published in 1841. A seventh edition, published in 1856, was substantially rewritten and extended by another EIC surgeon, James Ranald Martin. Other medical texts written by Johnson also enjoyed considerable popularity in Britain. In writing manuals designed for use in Europe, Johnson continued to draw on his experience in India, in elaborating his theories of disease causation, and in advice for the preservation of health. Alluding to Hindu dietary habits, Johnson's *Economy of Health* warned against the adverse effects of heavy consumption of animal flesh. The same volume considers human health with reference to each phase of life, certain activities being appropriate to certain ages – an idea which Johnson may have borrowed from Hindu culture.³⁸ Johnson's etiological ideas found particular favour in

33 On classification see M. Foucault, *The Order of Things. An Archaeology of the Human Sciences*, London, 1970.

34 Johnson, op. cit. (22), 32, 416–17.

35 Ibid., 422.

36 Ibid., 437.

37 Ibid., 456–7.

38 Johnson, op. cit. (21), 8–9.

Britain during the cholera epidemic of 1831–32. When cholera first reached Britain, a ‘contagionist’ view was dominant in official circles, and was favoured by many in the general medical profession. But as the epidemic spread, unevenly, throughout Britain the notion of ‘contingent-contagionism’ began to gain ground. Johnson’s contribution to the debate was to point out atmospheric and other environmental factors that might have accounted for the appearance of cholera in one place and its absence from another.³⁹

Though Johnson was the most influential writer on tropical diseases in this period he was by no means the only one. Several other authors of Indian experience are worthy of note. In the 1820s and 1830s anatomical as opposed to meteorological distinctions between diseases began to figure more prominently in colonial medical texts, reflecting the gradual assimilation of the concepts and methods adopted by Broussais and other pathological anatomists in France. In William Twining’s *Clinical Illustrations* fevers are classified more in accordance with their effects on particular organs of the body than an observation of their symptoms. Dysentery, for example, is defined as ‘an inflammation of the mucous membrane... of the large intestine’, while post-mortem examinations enabled Twining to identify ‘local congestions’ as the seat of remittent fever.⁴⁰ The ‘localizing tendency’ of pathological anatomy had led Twining, in common with most British writers on fever, to modify existing notions of a universal inflammation or ‘disease state’.⁴¹

But, in terms of etiology, Twining’s ideas were little different from those of his predecessors. In *Clinical Illustrations* we encounter familiar descriptions of environmental and predisposing causes. The climate of Bengal had a ‘remarkable influence’ on its inhabitants; its ‘atmospheric vicissitudes’ were responsible for ‘causing and modifying the diseases to which all classes of...inhabitants were liable’.⁴² Intermittent fever was ‘intimately connected’ with diurnal changes in temperature taking place at the start of the cold season. Cholera was ‘not readily communicated by human contact...[but]...prevail[ed] most among persons who reside in low and ill-ventilated stations, exposed to a humid atmosphere and to sudden changes in weather...and who indulge in eating cold or unripe fruits’.⁴³ Similar views were expressed by James Ranken in an address to the Calcutta Medical and Physical Society in 1836. He maintained that the choleraic miasm was produced by the action of humidity upon decaying organic matter. Those of bilious or nervous dispositions were particularly susceptible to the effects of its vapours.⁴⁴ However, with careful attention to lifestyle, there was much the European could

39 Johnson, op. cit. (22); M. Durey, *Return of the Plague: British Society and the Cholera 1831–2*, Dublin, 1979, 105–18.

40 W. Twining, *Clinical Illustrations of the More Important Diseases of Bengal with the Results of an Enquiry into their Pathology and Treatment*, Calcutta, 1835, 53–287. This is the second and an extended edition; the first being published in 1823. See also C. A. Annesley, *Researches into the Causes, Nature, and Treatment of the More Prevalent Diseases of India*, Calcutta, 1828. The first dissection of a human body performed in India with official sanction took place at the Calcutta Medical College in 1836: *Centenary of the Medical College of Bengal*, Calcutta, 1935, 13.

41 Pelling, op. cit. (14), 15; Bynum, op. cit. (28), 137–9.

42 Twining, op. cit. (40), 1.

43 Ibid., 31–2, 297.

44 J. Ranken, ‘On public health in India’, *Transactions of the Calcutta Medical & Physical Society*, Calcutta, 1836, 300–50.

do to protect himself against the effects of the tropical climate. Like Johnson, Twining believed that Europeans ate and drank a good deal more than was good for them. 'Hypernutrition' left them prey to fever and 'prickly heat'. He exhorted them, instead, to eat only a light breakfast, a tiffin of bread, fruit, and cool water, and a well-balanced dinner. This, Twining maintained, was the essence of tropical hygiene.⁴⁵

Twining and Ranken stood on the threshold of a new phase of tropical hygiene: innovative as regards clinical diagnosis, but retaining a familiar etiological framework. Twining also retained the belief that Europeans could learn much from indigenous practices. 'Some of the habits and customs of Asiatics', he believed, were 'worthy of consideration'.⁴⁶ But attitudes towards indigenous culture were changing in the 1820s and 1830s. EIC surgeons began to reflect the prevailing ethos of utilitarianism, embodied in the sweeping administrative reforms of the Bentinck era.⁴⁷ Symbolic of this shift in European attitudes was the decision in 1835 to abolish vernacular medical colleges, established by the British in the early years of the nineteenth century, and to replace them with English language colleges providing instruction in western medicine only. A commission established by Bentinck criticized the vernacular colleges for their omission of practical anatomy, the inadequacy of their tuition, and the absence of a proper qualifying standard for admission.⁴⁸

This increasing contempt for indigenous culture is most clearly demonstrated in the work of James Ranald Martin, Presidency Surgeon of Bengal and later President of the EIC's medical Board.⁴⁹ While Martin had some sympathy for Moslem culture, and for the 'martial races' of northern India, he discoursed at length on the degenerate habits of the Bengali:

The Bengallee, unlike the Hindu of the north, is utterly devoid of pride, national or individual. His moral character is a matter of history ... when we are looking forward with such well-founded hope to the improved results of European knowledge and example diffused among the natives.⁵⁰

Martin's scathing attack was typical of the age. He had great admiration for the utilitarian Governor-General William Bentinck, and drew on James Mill's utilitarian critique of traditional cultures.⁵¹ However, it was the Bengali's 'neglect' of hygiene that most concerned Martin. 'The natives have yet to learn ...', he wrote, 'that the sweet sensations connected with cleanly habits, and pure air, are some of the most precious gifts of

⁴⁵ Twining, *op. cit.* (40), 44–5.

⁴⁶ *Ibid.*, 420.

⁴⁷ William Bentinck, Governor-General of India 1828–35, implemented a series of reforms which applied the Benthamite principles of efficiency to most aspects of administration in India. For the first time, the Company began to interfere directly in the cultural and religious practices of the Indian people. There were attempts to abolish *sati* (the cremation of Hindu widows) and other customs, which were now regarded as medieval superstition. See Bearce, *op. cit.* (10), 69–78; E. Stokes, *English Utilitarians and India*, Oxford, 1959.

⁴⁸ See Patterson, 'Science and medicine in India', *op. cit.* (12); *The Centenary of the Medical College, Bengal*, *op. cit.* (40), 1–9.

⁴⁹ DNB. Sir James Ranald Martin (1793–1874). Son of a minister on the Isle of Skye. Admitted as a student at St George's Hospital, London in 1813 and MRCS in 1817, whereupon he joined the Bengal Medical Service. After three years in Orissa he began civil practice in Calcutta. Martin left India in 1843 and was admitted FRCS in the same year; in 1845 he was elected FRS. He was knighted in 1860.

⁵⁰ J. R. Martin, *Notes on the Medical Topography of Calcutta*, Calcutta, 1837, 45.

⁵¹ *Ibid.*, 43.

civilization'. Neither did they seem to be impressed by the importance of pure water. 'Every where', he claimed, 'one finds the tanks in an impure and neglected condition'.⁵² Johnson and Twining had found much of benefit to the European in indigenous hygienic practices, but for Martin they had come to symbolize all that was corrupt and degenerate in indigenous society. The Indian people, as well as the Indian climate, were now viewed as part of the 'sanitary problem' facing Europeans in the subcontinent. The identification of Indians with dirt and disease was part and parcel of the utilitarian attempts to reform and re-order Indian society.⁵³

But what had caused the Bengali to 'degenerate' and the European to prosper and advance? Martin had no doubt that it was climate that determined human character, in the same way as it exerted an important influence on disease:

When we reflect on the habits and customs of the natives, their long misgovernment, their religion and morals, their diet, clothing, etc, and above all, their *climate* [his emphasis] we can be at no loss to perceive why they should be what they are.

According to Martin it was axiomatic in medical topography that 'a slothful squalid-looking population invariably characterizes an unhealthy country'. It was climate that enabled the Hindu 'to live heedless and slothful' and that forced the native of Holland to be 'careful, laborious and attentive to excess'.⁵⁴ As justification for his climatological determinism, Martin cited the doctrines of Malte-Brun and Montesquieu.⁵⁵ It is well known that Montesquieu believed that the physical environment, especially climate, impinged on human character and the nature of political institutions.⁵⁶ In the causation of disease, Martin, like his mentor Johnson, believed that India's different seasons gave rise to different afflictions: the hot season to accelerated pulse, nervous excitability, and eruptive diseases; the rainy season to fevers of all kinds, especially malaria; the cold season to congestive fever and hepatic disorders. As in earlier texts, prevention consisted of the avoidance of epidemic influences, of extreme temperatures, and in abstemious and temperate behaviour.⁵⁷ Martin was similarly pessimistic about the possibility of European acclimatization to tropical climates.⁵⁸

One innovative feature of Martin's texts, particularly *Medical Topography*, was his use of medical statistics as a way of demonstrating correspondences and dissimilarities between natural phenomena. Martin's appears to be the first systematic use of

52 *Ibid.*, 24, 27–8.

53 Cf. M. Douglas, *Purity and Danger. An Analysis of Concepts of Pollution and Taboo*, London, 1966, 2: 'In chasing dirt... we are not governed by anxiety to escape disease, but are positively re-ordering our environment, making it conform to an idea'. Curiously, Martin's respect for his mentor, James Johnson, was such that he did not erase Johnson's references to indigenous hygiene from his re-writing of Johnson's classic text in 1856. See J. R. Martin, *The Influence of Tropical Climates on European Constitutions, including Practical Observations on the Nature and Treatment of the Diseases of Europeans on their return from Tropical Climates*, London, 1856.

54 Martin, *op. cit.* (50), 43, 45, 52.

55 Martin, *op. cit.* (53), 35.

56 E.g. Baron de Montesquieu, *The Spirit of the Laws* (tr. T. Nugent, ed. F. Neumann), New York, 1949. Montesquieu's own ideas about climate and human character were, themselves, derived from eighteenth-century medical texts.

57 Martin, *op. cit.* (53), 38–49; *op. cit.* (50), 99.

58 Martin, *op. cit.* (50), 94.

quantification in the literature on tropical hygiene, though it was recommended as early as 1784.⁵⁹ *Medical Topography* takes the form of a historical account of Calcutta and its environs, and its past afflictions with disease, together with descriptions of the present state of the city, and figures relating to mortality (of each race), rainfall, temperature, atmospheric pressure, and so on. In 1835, Martin successfully persuaded the new Governor-General, Lord Metcalfe, to institute a scheme whereby sanitary reports were collected from each town and cantonment, and collated in each presidency. In 1856 Martin requested that a medical officer of senior rank be appointed in a full-time capacity as a medical topographer to the British and Indian armies, though this was not realized until 1869 with the appointment of a Statistical Officer to the Government of India.⁶⁰ Martin's influence may also be observed in subsequent investigations into epidemic disease in India, and also in the preparation of medical texts in Britain.⁶¹

However, in the 1840s and 1850s concepts of disease causation were becoming more specific in character: a logical progression of advances in pathological anatomy which had enabled medical men to examine the effects of certain diseases upon specific organs in the human body. Developments in organic chemistry associated with the German chemist Justus Liebig accelerated the tendency towards specificity in disease causation. Liebig held that diseases were caused by specific poisons, causing molecular changes to occur in the blood of an infected person. The whole process was analogous to fermentation, with the morbid poison acting in a similar way to yeast. He referred to this process as 'zymosis'. Liebig's ideas met with a generally favourable response from medical men and scientists in Britain, and William Farr, Britain's first state epidemiologist, began to categorize certain diseases (including cholera) as 'zymotic' in his annual reports.⁶² Liebig's ideas could be easily incorporated within a conceptual framework which gave primacy to the action of climate and physical process in the causation of disease, and for this reason the notion of 'zymosis' rapidly gained adherents among the British medical profession in India. By 1870 it had become the standard means of classifying diseases, like cholera, which were thought to emanate from decaying organic matter.⁶³

The views of Liebig's contemporary John Snow were far more controversial. The notion of 'continuous molecular action' advanced by Snow in 1853 bore many similarities to Liebig's concepts of zymosis but, unlike Liebig, who did not posit any particular medium for the spread of cholera, Snow held that the disease was transmitted almost exclusively in drinking water. Many British medical practitioners were prepared to admit that 'bad water' might play a part in the causation of cholera, but it was quite another thing to accept Snow's claim that it was the only medium of the disease. Thus, Snow's theory was

59 See Balfour, *op. cit.* (29), 48.

60 Martin, *op. cit.* (53), 114–15.

61 Charles Murchison's classic *Treatise on the Continued Fevers of Great Britain*, 1st edn, London, 1862, bears many resemblances to Martin's *Medical Topography* in terms of its historical approach and its quantification of medical, geographical, and meteorological phenomena. Murchison, a graduate of Edinburgh University, had, like Martin, served in the EIC's medical service in Bengal and Burma. Murchison's explanation of the causes of continued fevers also owed much to observations he had made in India. See Pelling, *op. cit.* (14) 288–9.

62 Pelling, *op. cit.* (14), 113–45. See also J. B. Morrell, 'The chemist breeders: the research schools of Liebig and Thomas Thompson', *Ambix* (1972), 19, 1–46.

63 See, for example, *Reports of the Sanitary Commissioner with the Government of India*.

rejected as a suitable basis for sanitary action by the Board of Health's Committee for Scientific Enquiries on the grounds that it was too exclusive. Nevertheless, the 'waterborne' theory slowly gained ground among members of the British medical profession. In 1866 in an address on the 'Medical and Legal Aspects of Sanitary Reform', the respected physician Dr A. P. Stewart declared that 'the idea that Dr. Snow's views might... be true is now firmly fixed in the public mind... While there are many, like myself, who could not admit their being proved they are tacitly of opinion that they are highly probable'.⁶⁴

The ideas of disease causation advanced by Liebig and Snow underpinned E. A. Parkes' *Practical Hygiene*, which became the standard text for military medical men in Britain and the colonies in the 1860s, 1870s and 1880s.⁶⁵ Parkes – who had gained several years' experience in India – believed, like his predecessors, that diseases had at least two causes: 'predisposing' (within the body) and 'exciting' (external to the body). His most significant departure (*pace* Liebig) was the idea that these exciting causes were *specific* poisons, arising from putrefying matter. Different fevers were attributed to different poisons: ague to material of vegetable origin; enteric fever to material of animal origin.⁶⁶ He thought that enteric fever was transmitted in the faeces of a victim and contracted through ingestion of the infected matter. Cholera was ascribed to the action of a 'specific agent', transmitted in the stools of the victim, usually in contaminated water or food.⁶⁷

Accordingly, Parkes believed that preventive measures should be made more specific. He paid greater attention to purification of water and to disinfection than any previous writer on tropical hygiene, and stressed the need for regular inspection of water and food for impurities and parasites.⁶⁸ But Parkes felt that there should be a balance between public and personal hygiene, which took into account an individual's constitution and state of mind:

64 J. Snow, *On the Mode of Communication of Cholera*, 2nd edn, London, 1855, *On Continuous Molecular Changes, more particularly in their relation to Epidemic Diseases*, London, 1853; A. P. Stewart and E. Jenkins, *The Medical and Legal Aspects of Sanitary Reform, 1866–69*, London, 1869, 10.

65 D. E. Watkins, 'The English Revolution in Social Medicine, 1889–1911', (University of London Ph.D. thesis, 1984) 347–57; P. D. Curtin, *Death by Migration: Europe's Encounter with the Tropical World in the Nineteenth Century*, Cambridge, 1989, 59, 105.

66 E. A. Parkes, *Manual of Practical Hygiene. Prepared Especially for Use in the Medical Service of the British Army*, London, 1864, eg. pp. xvi, 437. *DNB*. Edmund Alexander Parkes (1819–1876), educated at Christ's Hospital, London and University College London. Graduated MB and admitted MRCS in 1840. In 1842 joined the Army Medical Service and served for three years in India. There, he gained experience of dysentery, hepatitis, and cholera. In 1845, Parkes retired from the army and went into private practice in London. In 1846 he graduated MD from London University, with a thesis on dysentery and Indian hepatitis. From 1852 to 1855 Parkes edited the *Medico-Chirurgical Review*, and in 1860 was appointed professor of hygiene at the newly-founded Army Medical School, Chatham. The school was transferred to Netley in 1863. At Netley, Parkes carried out important research in several branches of medicine and imparted his views to successive generations of Indian, Army and Naval Medical Service recruits. See also Pelling, op. cit. (14), pp. 70–4.

67 Parkes (1864), op. cit. (66), 431, 437.

68 *Ibid.*, 21–2, 36, 47–8, 158, 432. However, acceptance of specific modes of putrefaction did not necessarily entail the implementation of more specific preventive measures. As Christopher Hamlin has put it, 'The zymotic analogy made it plausible to think of the entire insanitary environment as contributing... [to epidemic disease], while the perpetual threat to health of putrefaction was the basis on which Simon and his medical inspectors harried local officials into removing filth': C. Hamlin, 'Providence and putrefaction: Victorian sanitarians and the natural theology of health and disease', in *Energy and Entropy. Science and Culture in Victorian Britain* (ed. P. Brantlinger), Bloomington, Indiana, 1990, 93–123.

For a perfect system of hygiene we must combine the knowledge of the physician, the schoolmaster, and the priest, and must train the body, the intellect, and the moral soul in a perfect and balanced order. Then... we should see the human being in his perfect beauty as Providence perhaps intended him to be; in the harmonious proportion and complete balance of all parts, in which he came out of his Maker's hands.⁶⁹

Yet, unlike the authors of earlier manuals, Parkes paid little attention to Asiatic customs and made no mention of their utility in preserving the health of Europeans. In the area of diet, for example, there are no references to the habits of the Hindu, but instead a scientific calculation of the amount of carbohydrate, nitrogen, fats, and salts required to sustain the body in a balanced state of health.⁷⁰ Attitudes towards indigenous peoples had hardened considerably since the Indian Mutiny of 1857 and the assumption of direct rule by the Crown the following year. It was the application of reason that allegedly distinguished British rule from oriental despotisms, and western from traditional Indian medicines. 'Besides the element of superstition', wrote the editor of the *Indian Medical Gazette* (hereafter *IMG*) in 1868, 'there are other causes that separate the European from the Native practitioner. Both Hindoos and Mohamedans cling with blind obstinacy to the theoretical dogmas of the ancient fathers of medicine... Their primary want', he continued, 'is that of a scientific nomenclature of disease, theirs being either fanciful... or unintelligible to the rest of the civilized world'.⁷¹ Western science, particularly pathological anatomy and the increasing specificity of western ideas of disease causation, had created a gulf between western and indigenous systems of medicine; a gulf that seemed unbridgeable in the atmosphere of mutual distrust which followed the events of 1857.

Parkes' ideas found favour primarily with new recruits to the Indian Medical Service; at the top of the medical profession in India the ideas of Bryden, Twining, and Johnson were still widely held, having undergone only slight modification. Senior IMS officers who had built their professional reputations upon these ideas – and who were personally convinced of their validity – were not about to abandon them overnight. Yet growing acceptance of Snow's waterborne theory in Britain and the discovery in the early 1880s of what appeared to be the bacteria causing enteric fever and cholera, and the parasite causing malaria, made some reappraisal necessary. While some denied that the existence of such organisms had been proven or that they were causally related to disease, others attempted to assimilate new developments within existing views of the Indian disease environment. Nowhere is this approach more evident than in the writings of Sir Joseph Fayrer, President of the Medical Board of the India Office from 1873 to 1895.⁷²

⁶⁹ Parkes *Practical Hygiene*, op. cit. (66), p. xvi.

⁷⁰ *Ibid.*, 132–6. A small minority continued to believe that the Hindu diet was the diet best suited to life in tropical climates. See G. H. Fink, 'Food of the natives of India', *JTM* (October 1906), 310–12. But Fink wrote as a retired medical man, a representative of an out-moded viewpoint. In the 1860s nutrition was becoming an important area of chemical research, a consequence of the perception that there was a common ground between the organic/inorganic, animate/inanimate realms.

⁷¹ *IMG* (April, 1868), 87.

⁷² *DNB*; obituary, *Trans. Epid. Soc.* (1906–7), 26, 78–9. Sir Joseph Fayrer (1824–1907), born in Plymouth, the son of a Commander in the Royal Navy. After a brief study of engineering, Fayrer made a voyage to the West Indies and South America as a midshipman on a West Indian steampacket. In 1843 he sailed with his father to Bermuda, where his experience of an outbreak of yellow fever inclined him towards medicine. After entering Charing Cross Hospital in 1844, Fayrer was admitted MRCS in 1847 and gained a commission in the medical

Whereas Parkes' orientation was primarily physiological, Fayrer's was epidemiological and 'holistic'. Fayrer continued to expound a 'natural-historical' approach to medicine, taking into account a wide variety of natural phenomena. In his study of cholera, published in 1888, Fayrer declared that it was his purpose to give a brief review of its:

history, habits, method of diffusion, geographical distribution, relation to climate, season, meteorological conditions and locality, its etiology, its effects on the human race, and...the methods which experience has taught us are most efficient in mitigating or preventing it.⁷³

Fayrer stressed the uniqueness of the Indian disease environment and the distinctive behaviour of diseases in the tropics. 'The people and their habits', he wrote, 'the animal and vegetable creation, even the diseases differ from those... [the European new to India] has known hitherto'.⁷⁴ However, Fayrer was wary of setting forth any definite views upon the causation of epidemic diseases like cholera. Assessing Snow's waterborne, and atmospheric and human contact theories of cholera causation, Fayrer admitted that:

For my own part I am unable to convince myself that any of these theories satisfactorily or conclusively explain all the phenomena exhibited by a cholera epidemic, or that one view can be accepted to the exclusion of the other.

He was critical of those who pursued narrow and exclusive avenues of investigation:

The cause will probably not be revealed to any one who searches with narrowed views. There is a great tendency in these days to trace all disease to a specific exterior cause, but we must not lose sight of the possibility of poisons autogenetically developed...or of altered conditions of innervation.⁷⁵

Nevertheless, Fayrer could not conceal his own bias towards the atmospheric theory, and his disinclination to accept the waterborne theory (then generally accepted by the British medical profession) to the exclusion of other explanations. 'The suddenness and virulence of certain outbreaks [of cholera]', he noted, 'are remarkable, and seem to point to some factor apart from contagion or local insanitary conditions'. Rather, the evidence seemed to point to changing meteorological conditions:

At Kurrachee, in 1846...there was a sudden change in the atmosphere, the wind veered from south-west to north-east, and a thick lurid cloud darkened the air. Later in the evening cholera appeared in thirteen corps of the troops stationed there.⁷⁶

service of the Royal Navy. Soon afterwards, Fayrer resigned his commission to travel around Europe in the company of Lord Mount-Edgcumbe. He ended his tour at Rome, where he resumed his study of medicine and, in 1849, obtained its MD degree. In 1850 Fayrer left Europe to take up the post of Assistant Surgeon in the Bengal Medical Service, where he busied himself in medical and cultural activities, becoming President of the Asiatic Society of Bengal in 1867. He was instrumental in setting up a zoological society and the zoological gardens in Calcutta. In 1869 Fayrer became personal surgeon to the new Viceroy Lord Mayo but, in 1872, returned to Britain because of ill health, whereupon he was appointed President of the India Office Medical Board. Fayrer was widely respected in Britain, becoming personal physician to the Prince of Wales and President of the Epidemiological Society in 1879. He was made CSI in 1868 and a baronet in 1896. A prolific writer on medicine, climatology and venomous snakes, Fayrer was one of the last exponents of the 'universalistic' approach to medicine which typified the IMS in the first half of the nineteenth century.

73 J. Fayrer, *The Natural History and Epidemiology of Cholera*, London, 1888, 6.

74 J. Fayrer, *Preservation of Health in India*, London, 1894, 9.

75 Fayrer, op. cit. (73), 52–3.

76 Ibid., 36.

'Impure water' (not necessarily water containing a specific contagion) was just one among many efficient and predisposing causes of cholera, of which atmospheric changes were most important. Fayrer was supported in these views by other IMS officers writing on cholera in the 1880s. Henry Bellew, Sanitary Commissioner of the Punjab, maintained that:

cholera does not spread from one part of the country to another along the principal lines of human traffic... The course of progress of cholera epidemics are wholly dependent on climatic or weather influences, aided by the...existing condition of the general health standard of the population.

These conditions were brought about by 'an abnormal excess of atmospheric temperature and humidity, coupled with changes in the electric condition of the air and the amount of its present ozone'.⁷⁷ Writing on the Egyptian cholera epidemic of 1883–84, Sir W. Guyer Hunter – a retired IMS officer – claimed that 'meteorological conditions had a strong influence in the generation... [of cholera]'. 'It is probable', he continued, 'that it is to a combination of certain conditions of a cosmo-telluric character... that the development of an epidemic is due'.⁷⁸

Fayrer had much the same opinion of the causation of malaria and enteric fever as he had of cholera. He was prepared to admit that specific organisms might have some role in the causation of disease, but stressed the importance of more general environmental conditions:

The specific poisons which produce typhus, enteric fever, and some other diseases are probably as active in India and other tropical countries as they are here [in Britain], but I submit that fever with Peyerian ulceration may and does occur from causes other than faecal contamination. ... The chief factors in the causation of fevers in India seem to be the vicissitudes of temperature, meteorological states, terrestrial emanations... from marshy... ground..., or impure water; such also being determining causes of cholera, dysentery and diarrhoea.⁷⁹

It seems to have been accepted wisdom in India that climatic factors were vital in the causation of enteric fever, a disease most prevalent in the hot season. Young and unacclimatized soldiers were thought to be most at risk.⁸⁰ In accordance with these notions, the British Army in India had been divided into groups of stations occupying similar geographical and meteorological zones. These locations were thought to be governed by 'like epidemic influences', beneficial to the health of Europeans.⁸¹ In civilian life, concern with the morbid effects of climate manifested itself in the building of 'sanatoria' at various hill stations throughout India. It was generally believed that altitude had some bearing on the distribution of certain diseases, particularly malaria and cholera.⁸²

77 H. H. Bellew, *The Nature, Causes, and Treatment of Cholera*, London, 1887, 19. By this time, both ozonic and electrical theories were out of vogue in Britain: see Pelling, *op. cit.* (14), 148.

78 W. Guyer Hunter, 'The origin of the cholera epidemic of 1883 in Egypt', *Trans. Epid. Soc.* (1883–4), 3, 51. See also, C. A. Gordon, 'Experiences in relation to cholera in India from 1842 to 1879', *Trans. Epid. Soc.* (1895–6), 15, 48–67.

79 J. Fayrer, *On the Climate and Fevers of India. Being the Croonian Lectures delivered at the Royal College of Physicians in March 1882*, London, 1882, 59–60. See also J. Fayrer, 'Enteric fever among British soldiers in India', *JTM* (September 1898), 29–31.

80 *Report of the Sanitary Commissioner to the Government of India* (1877), 24.

81 *Report of the Sanitary Commissioner to the Government of India* (1870), 1.

82 See for example: on malaria, *IMG* (March, 1871), 57; and on cholera ('William Farr's law of 'cholera elevation'), Pelling, *op. cit.* (14), 89.

Though most medical men in India were convinced at this time of the value of acclimatization, despite a certain amount of evidence to the contrary, there was continued pessimism about the possibility of long-term European settlement in India.⁸³ According to Fayer:

the hill stations of India promise to become a permanent home to many of the class of planters, landowners, and even retired... officers. Such stations, notwithstanding their excellent climate, are, I think, too few and far between and too isolated to become the seats of real colonization.

His chief concern was with the health of European children in India. 'The child must be sent to England', he urged, 'or it will deteriorate physically and morally... it grows up slight, weedy, and delicate, over-precocious it may be, and with a general constitutional feebleness'.⁸⁴ Fayer's verdict on acclimatization seems to have been representative of medical opinion in India at this time, though there were some medical men who believed Europeans were capable of adapting to life in the tropics.⁸⁵ The most prominent of these in India was Sir William Moore, honorary surgeon to the viceroy. Moore believed that 'dark-skinned' Europeans – of 'sanguine temperament' – were most suited to tropical climates:

Theoretically, it would seem possible that the European, who in type and temperament most closely resembles the condition to which climate and mode of life has converted the native of India, would be best-fitted to encounter the adverse influences of a tropical climate; and practically this appears to be the case.

However, Moore was less optimistic about the adaptation of women and children. In tropical climates the latter invariably grew up 'weak and weedy', while the former were 'specially subject to tropical influences' because of the alleged effects of heat upon menstrual activity.⁸⁶ Moore recognized that, without women and children, there was little chance of permanent European colonization of the tropics. This general pessimism about the possibility of European acclimatization persisted until the late 1890s, when advances in tropical medicine – particularly Ross's identification of the mosquito vector of malaria – engendered a belief that human ingenuity could conquer even the most hostile of climates.⁸⁷

83 Curtin, *op. cit.* (65), 48.

84 J. Fayer, *European Child Life in Bengal*, London, 1873, 30–1.

85 See D. N. Livingstone, 'Human acclimatization: perspectives on a contested field of inquiry in science, medicine and geography', *History of Science* (1982), 25, 359–94; also A. S. Thompson, 'On the doctrine of acclimatization', *Madras Quarterly Medical Review* (1840), 2, 69–76; J. Ewart, 'On the colonisation of the sub-Himalayahs and Neilgherries, with remarks on the management of European children in India', *Trans. Epid. Soc.* (1883–4), 3, 96–117.

86 W. Moore, 'The constitutional requirements for tropical climates, with special reference to temperaments', *Trans. Epid. Soc.* (1884–5), 4, 37–8, 46, 48. See also Moore's 'Is the colonisation of tropical Africa by Europeans possible', *Trans. Epid. Soc.* (1890–1), 10, 27–45. According to Moore, 'the Anglo-Saxon race, excepting probably the Jews, are perhaps better fitted to brave extremes of climate than any other section of mankind' (p. 29). An optimistic note about colonization – though confining its attention to the hill stations of India – is struck in J. Chesson's *Second Report on the Hill-Station of Panchgunny, near Mahableswar*, Bombay, 1862.

87 The parasitologist L. W. Sambon and Robert Koch were two of the foremost exponents of this view. See also Livingstone, *op. cit.* (85), 369.

CONCLUSION

The predominantly metropolitan perspective of existing studies of tropical medicine has given the impression that little of significance occurred in this branch of medicine before 1880, beyond a vague awareness of the problem of 'tropical disease' and isolated attempts to overcome it. This essay has attempted to show that, on the contrary, medical knowledge and practice in British India was significantly different from that in Britain, and that it was far from being subservient to British medical authority. Prior to 1860, 'medical science' in India was in no sense the 'poor relation' of its metropolitan counterpart, with colonial medical men challenging and making important contributions to the development of medical knowledge in Britain on the basis of their Indian experience. Within India, tropical hygiene performed important symbolic as well as practical functions, reflecting changes in the cultural and political relationship between rulers and ruled.

It is possible to identify several, relatively distinct phases in this relationship, as exhibited in European medical texts. The earliest period examined above, and which is typified by the writings of James Lind, shows great optimism about the possibility of the permanent colonization of India because of the effect of climate in modifying the European to life in the tropics. Also characteristic of this period was the concept of 'environmental determinism': the conviction that climate exercised a powerful influence on health and on human affairs. Lind's work demonstrates the profound psychological effect of these new surroundings on the mind of the European, regardless of whether this experience was filtered through some understanding of indigenous culture. Belief in the effects of climate upon disease dominated medical literature until at least the mid-nineteenth century, and is illustrated by the work of James Johnson. Johnson and his contemporaries were at pains to point out the distinctiveness of the Indian environment, but they did not hesitate to draw on their experience in their contributions to the development of medical knowledge in Britain. Johnson's work reached a wide audience in Britain, as did the medical ideas of his contemporary Maclean. Their ideas found particular favour with Benthamite radicals – like Southwood Smith – who sought to reform medical education and find a basis for sanitary action. One other important feature of medical literature in this period was the apparent willingness to learn from indigenous practices, especially those concerned with hygiene and survival in tropical climates. But though it was thought that much could be done to mitigate the effects of climate, there was now a belief that Europeans were constitutionally unfitted to life in the tropics. The hardening of racial divisions was both a cause and a consequence of a more general trend in the classification of the natural world: the division of natural phenomena into discrete entities.

By the late 1830s medical texts came to reflect the prevailing ethos of utilitarianism, and the increasing gulf between European and Indian culture. No longer was there a sense that anything of value could be gleaned from indigenous medical texts or hygienic practices: Indians themselves, with their 'filthy' habits and 'degenerate' behaviour were now identified as part of the sanitary problem. This division hardened considerably in the atmosphere of distrust generated by the Mutiny of 1857, and as a consequence of developments in western medicine stemming from pathological anatomy and the organic chemistry of Justus Liebig. Coincident with these developments was the increasing use of

medical statistics, which set on a quantitative footing the 'natural historical' method employed by EIC surgeons since the mid-eighteenth century. This 'universalistic' approach remained dominant in Indian medical circles into the 1890s, as is illustrated by the voluminous work of Sir Joseph Fayrer.

At the same time, new recruits to the IMS, who had trained under Edmund Parkes at Netley, brought fresh ideas with them to India. Snow's waterborne theory of cholera transmission rapidly gained ground amongst them, as did the notion that diseases had a sole or specific cause. Fayrer and older officers of the IMS thought these ideas too exclusive, and sought to integrate them within their universalistic etiological framework. They were concerned lest undue emphasis on a specific cause and its mode of spread detract from the existing broad and inclusive approach to sanitation. But it is unlikely that medical judgements were made purely on the basis of 'practical' considerations. Continuing belief in the uniqueness of the Indian disease environment was probably the most important factor in accounting for the slowness of the IMS to assimilate certain new scientific ideas.