

*A global history of science and religion**Sujit Sivasundaram*

The period between the rise and the fall of the British empire – that is, from the late eighteenth to the mid-twentieth centuries – witnessed an intense encounter between religious cultures and scientific ideas across the globe. Colonialism brought with it the movement of peoples and the imposition of new political structures worldwide. Many religious believers sought to redefine their faith in line with new scientific thinking. Given the violence of the imperial experience, it is tempting to imagine that different sciences and religions came into conflict during this period. Yet it is the argument of this chapter that this is a misguided view. The formal and informal British empire saw different intellectual traditions borrow ideas and forms of organization from each other. Different communities repositioned their histories and futures by drawing on both science and religion. There was an interrogation of beliefs about nature and life in the face of fresh ideas imported from other parts of the globe, and this interrogation often led to the synthesis, collaboration, and renewal of both the sciences and religion. Thus this story cannot be reduced to either a model of conflict or of complementarity.

This chapter presents a global history of science and religion for territories that came under British control or influence; it takes ‘global’ as a label of historical methodology indicating the analysis of broad patterns and connections across space, rather than a comprehensive history of all regions. A discussion of how sciences and religions were linked with the global history of the British empire should be symmetric in recovering the perspective of both colonizers and colonized. To that end this chapter will begin by considering how Christian missionaries were implicated in the globalization of science. Missionaries were pivotal agents in the translation of existing indigenous science and in teaching western science. They were at the forefront of the intellectual encounters of the British empire. Because missionaries defined their vocation to include the study of God’s creation, they wrote popular texts and scientific articles, often based on information

gathered in the field. By contributing to the emergence of new disciplines and by defining new ways of classifying peoples and territories, Christian missionaries helped give birth to the modern scientific understanding of the world. Yet this recovers just one side of the encounter between sciences and religions in the context of colonialism.

A global history must also include the rich traditions of knowledge which were already flourishing in the world outside Europe prior to that continent's colonial expansion. It should also attribute active agency to indigenous peoples in narrating the reception of western science and religion. For Buddhist and Hindu intellectuals, Islamic reformers, Pacific islanders or African peoples, whose views will be covered in this chapter, the engagement with new scientific thinking provided a language for redefining identity. Although science contributed to secular ideologies of nationalism, and was at times resisted by religious movements that sought to return to ancient scriptures, non-western elites also frequently sought to prove the scientific heritage of their own religions and utilized the new science to project a new religious vision of their societies. For non-western peoples, as much as for colonizers, there was a lot to be gained by combining the insights of sciences and religions.

In presenting the argument that the meeting of different sciences and religions took many different and unexpected forms, and resulted in intellectual exchange and redefinition, it is possible to recast the history of science and religion in significant ways. Until very recently the grand narrative of the history of science and religion has been dominated by a western and especially a Protestant bias. This chapter shows how the story might be told in a more representative fashion. It therefore offers a way of redrawing the 'big picture'.

Inevitably this chapter relies heavily on the findings of many scholars who have contributed to the emerging global history of science and religion. While drawing on the work of others it seeks to synthesize accounts that take a national, geographic, or regional framework by showing how a larger perspective can be drawn out of many specific case studies. The argument also challenges scholars who work on the history of science and religion in either Europe or America and invites them to consider a global canvas. By considering the interaction between the sciences and religions in the non-western world it is possible to gain new insight into the placement of these intellectual traditions in the West, for colonialism forged global connections, allowing knowledge to cross oceans and continents.

In the first section I address the uses of science by Christian missionaries and then, in the second, I examine how members of several non-western

peoples used the intellectual resources of different sciences and religions to come to terms with colonialism.

MISSIONARIES AND THE GLOBALIZATION OF SCIENCE

One way to understand how missionaries practised science is to regard missionaries as authors. Consider, for instance, *Missionary enterprises* (1837) by the South Pacific missionary John Williams, which is thought to have sold 40,000 copies in its first three years. Williams's book spanned ethnography, history, natural history, and geography. His information on corals was used by Charles Darwin in his discussion of *Coral reefs* (1842). Williams was significant not just as one among many sources for a celebrated man of science. His own book, which contained a chapter on corals, was a contribution to science in its own right.¹ Another South Pacific missionary, William Wyatt Gill, published numerous articles on natural history from 1872 to 1882 in the periodical *Leisure Hour*, published by the Religious Tract Society. These articles took as their subjects: the poisonous white-shelled sea crab; the deadly South Pacific octopus; the megapode bird, which builds mounds 10 ft high and 60 ft in circumference; the painful centipede; the man-eating alligator; the sacred Pua tree; the easily cultivable papaw tree; and the lemon hibiscus tree.² As with Williams's narrative, Gill's commentary on natural history often merged with a discussion of the perversity of indigenous customs and provided an implicit legitimization of missionary presence.

British South Pacific missionaries contributed over 200 articles to scientific journals between 1869 and 1900.³ One example is George Brown, the Wesleyan Methodist missionary, who, according to one of his colleagues, 'cared more about his name being given to a new snake, bird or insect than he did for all the souls of New Britain people put together'.⁴ Brown started to submit specimens to the Zoological Society in 1877, and his collections and observations were cited in papers read before the Zoological Society. Another South Pacific missionary, S. J. Whitmee, always kept a container attached to the front of his saddle when he entered new territories, in order to collect natural history specimens. He employed a Danish assistant as a collector of specimens and published papers under his own name in the *Proceedings of the Zoological Society* from 1875.⁵

Attention to the different stages in knowledge-making – from the collection of information, to patronage, editing, publication, and reception – is important in making sense of the different results of missionary attempts to practise science. The science in popular narratives such as

Williams's *Missionary enterprises* and in later nineteenth-century periodical articles written by missionaries fits into what Anna Johnston calls 'mutual imbrication', which she sees as characteristic of the genre of missionary texts.⁶ By this term Johnston indicates how missionaries were forced to invent new ways of dealing with the unfamiliar, and how they attempted to challenge and complexify tidy metropolitan categories. For Johnston, the ambivalent relationship with imperial discourse and the internal tensions within missionary texts mean that they may be seen as constituting a distinctive genre. By extrapolation a case can be made that, in writing science, missionaries hoped not only to contribute to science but also to expand and redefine what counted as science in the metropolis. These texts served as challenges from the periphery, in a period when science was adopting its modern form.

As recent scholarship demonstrates, analysing missionary writing leads very quickly to the study of the self-conception of the missionary author. Gareth Griffiths, for instance, has shown how the output from missionary presses in the period of high imperialism at the end of the nineteenth century allowed evangelicals to adopt the secular tropes of hunting, soldiering, and exploration.⁷ Griffiths argues that the depiction of the missionary hero shifted from the mid-nineteenth century, when it was tied to humane paternalism, to the late nineteenth century, when it became more interventionist and even violent. By the early twentieth century the genre of missionary exploration had taken another turn by becoming fictionalized. For the historian of science, studying the trajectory of the missionary hero is important because it sheds light on the connections between science and vocation. Perhaps the most important missionary hero of the nineteenth century, David Livingstone, exemplifies the linking of science and religion in the shifting idea of what it meant to be a missionary. In order to capture Livingstone's ambiguous and yet successful conception of vocation Felix Driver has called him 'a missionary of science'.⁸

Livingstone decided to become a missionary because it enabled him to combine an interest in science with a religious vocation.⁹ In Africa he justified his enthusiasm for exploration by arguing that it helped expand the reach of Christianity. Livingstone's great transcontinental journey was made possible through the assistance of Sir Roderick Murchison, President of the Royal Geographical Society, which awarded Livingstone a sum of money for reaching Lake Ngami from Kolobeng. This money enabled Livingstone to purchase scientific instruments that were necessary for his epic journey. On the 1858 expedition, on which he embarked after achieving fame, Livingstone conformed to the usual pattern of British

scientific exploration: he took with him an artist (Thomas Baines), a geologist (Richard Thornton), and a botanist (John Kirk).

Livingstone oversaw the collection of natural history specimens and African artifacts. Analysing the role of material culture will no doubt prove another fruitful avenue for historians of science and religion to expand their analysis to territories outside Europe and America. Objects played a vital role in the missionary project. As Nicholas Thomas has shown, the meanings that became attached to them changed according to the context of acquisition, transportation, and display.¹⁰ For instance the so-called father of Protestant missionaries, the Baptist William Carey, established the most impressive private botanical garden in Asia at the start of the nineteenth century.¹¹ Carey's extensive correspondence network stretched from South Africa to America, via the Pacific. He gathered specimens in Serampore in north India and hoped to make his own garden and that of the East India Company centres for the study of botany. The natural history specimens that Carey collected helped him to conceptualize his relationship to 'heathen' territories. He saw natural history as a fitting intellectual enterprise for the missionary because it exercised the mind, and his study of nature enabled him to maintain the project of self-improvement he had begun before arriving in India.

By the end of the nineteenth century the missionary interest in objects was displayed on a grander canvas with such exhibitions as the Church Missionary Society's 'Africa and the East' (1909) and the London Missionary Society's 'Orient in London' (1908). Both were held in the Royal Agricultural Hall in Islington and then travelled to Manchester, Liverpool, and Birmingham, and, in a reduced form, to smaller towns.¹² Men and women from the colonies were themselves objects of curiosity, as visitors to the exhibitions watched their craftsmanship, including weaving, dyeing, carving, forging iron, and leatherwork. By studying collecting practices, historians can appreciate the contradictions inherent in the missionary engagement of science. Curiously for religious believers who set their hope on the afterlife, objects in this world became important as a means of coming to terms with the present and ensuring that the value of their work was recognizable both to themselves and others.

A. C. Haddon, Reader in Ethnology at the University of Cambridge, was personally involved in the 'Orient in London' exhibition, having been asked to assist with the display of comparative religions. In his introductory essay to the handbook to the Hall of Religions at this exhibition he provided a scholarly introduction to such terms as 'totem', 'fetish', 'ancestor cult', 'animism', and 'supernaturalism'.¹³ Missionaries' engagement with the

science of anthropology has recently received attention and reveals how missionaries contributed to the emergence of a classification of disciplines, and how they reacted to the widening gap between the expert and the amateur.¹⁴ According to Patrick Harries, by the end of the nineteenth century missionaries were keen to present their credentials as scholarly anthropologists. Likewise anthropology as a discipline depended heavily on the tribal commentaries written by field missionaries.¹⁵ Seeing that their commentaries were greatly valued, missionaries saw indigenous cultures differently by shifting their emphasis from the demonic character of local rites to an appreciation of their value. From this perspective they could make interventions in anthropological theory. For example Lorimer Fison, a Methodist missionary in Fiji, was in contact with Max Müller and Lewis Morgan in the 1860s and extended Morgan's evolutionary scheme by using it to classify kinship terminology. Likewise Robert Codrington, an Anglican missionary to Melanesia, questioned Edward Tylor's notions of animism by describing 'mana', a concept of supernatural power that he uncovered through a deep attention to translation.

However, by the second decade of the twentieth century, with the rise of functionalist anthropology and a growing distance from the older evolutionary framework, missionaries lost their status within the discipline. By the 1930s the missionary was no longer a participant in making anthropology but rather a subject for study. Missionaries' placement in the changing definition of what constituted anthropology suggests that historians should pay more attention to how missionaries defined and were subsequently excluded from emerging scientific disciplines.

The story of how missionaries engaged with the formation and changing fortunes of science has gained a considerable hold in recent years because of dramatic shifts in the general account of how missionaries fit into such major movements as the Enlightenment, the Industrial Revolution, and Darwinism. First, in relation to the Enlightenment, a recent volume of essays edited by Brian Stanley challenges the traditional view that missionaries should be viewed as counter-Enlightenment Romantic voices.¹⁶ It urges that the modern Protestant missionary movement reworked some long-held ideas within evangelicalism in the context of the Enlightenment. These ideas included a belief in the value of reason, the power of technology to civilize other cultures, and an insistence that the Christian message was addressed to individuals. British missionaries were directly influenced by the Scottish Enlightenment and also by a continental rational and Pietist tradition. Second, with respect to industrialization, it has now been established that the upbringing of many British missionaries in urban centres,

and their artisanal occupations prior to being called to be missionaries, meant that they were quick to take on manual tasks while working as missionaries, and that they paid particular attention to the material productions of the people to whom they preached. They were very keen to 'improve' themselves.¹⁷ While in their stations many missionaries utilized skills in agriculture and printing, and their contribution to medicine has been well documented. From an interest in practical skills it was a short step to science, and indeed a case can be made that missionaries' science was often more practical than theoretical.

There have also been important shifts in how historians view the reception of Darwin's work outside Europe and America. Darwin has now been cast as an enthusiastic supporter of missions. His firsthand experience of missionary work persuaded him of its value so greatly that his first publication, with Robert Fitzroy, was a defence of missions. Throughout his life he gave money to a missionary society, and he regularly received a missionary journal.¹⁸ Following on from Darwin himself, Ronald Numbers and John Stenhouse's edited collection of essays shows that Darwinian ideas were enthusiastically embraced by overseas Protestants, among others.¹⁹ Marwa Elshakry's work on the reception of Darwinism in the late Ottoman empire will take this argument further.²⁰ William Habens, a young Congregational minister in New Zealand, provides an example of a positive response to evolution: in 1872 he claimed that 'natural evolution was even a more wonderful thing than the creation itself'.²¹ These realignments in our view of the way missionaries and religious believers in the British empire responded to crucial moments in the history of science necessitate a reassessment of how we see missionaries. They need to be understood as figures who were moulded by and who successfully navigated the currents of intellectual change, rather than unthinking fanatics.

One aspect of missionaries' scientific leanings that has attracted sustained and sophisticated discussion is medicine. The call for missionaries to engage with the task of curing the sick had a biblical precedent in the life of Jesus, and curing diseases became a metaphor for curing souls. The number of medical missionaries worldwide ballooned through the long nineteenth century. Although there were only 40 in 1849, by 1925 Protestant missions from Europe and America had 1,157 doctors and 1,007 nurses in overseas clinics and hospitals.²² In East Africa, as Megan Vaughan urges, for most Africans before the Second World War any prolonged contact with medicine came through missionaries, and this brought with it the associated Christian moral framework. Central to this framework is what Vaughan terms 'new subjectivities': medical missionaries individualized Africans and

made them patients, and this discourse led easily to social control. The union of science and religion was thus vital to the changes that medical mission brought to East Africa.²³

Missionaries also played as vital a role as teachers. The content of mission education changed dramatically across the continents, and esoteric science was given pride of place in territories deemed 'civilized', such as India or China. Elsewhere missionaries slowly adopted what became known as 'adapted' education, an education said to be appropriate to the assumed ability and temperament of colonized peoples. In Africa this meant an education aimed at turning students into agricultural workers, mechanics, and tradesmen.²⁴

One illustration of the missionaries' use of science in education comes from the recent work of David Wright on China. The Society for the Diffusion of Useful Knowledge in China, founded in 1834 by one of the early missionaries to China, aimed to publish 'such books as may enlighten the minds of the Chinese, and communicate to them the arts and sciences of the West'. According to Wright, this Society took a strictly Paleyite line.²⁵ By the last decades of the nineteenth century scientific education had blossomed into a vast constellation of missionary schools where sciences ranging from astronomy to chemistry and botany were taught and where texts written by the likes of John Tyndall, John Herschel, and John Lindley were translated into Chinese.²⁶ Calvin Mateer, who taught at Dengzhou College in Shandong, wrote in 1877: 'The Chinese look upon the wonders which modern science has wrought as akin to the miraculous, and well they might, for so indeed they are. I argue hence that Protestant missionaries are not only authorized to open schools for the teaching of science but that providence calls them to do so'.²⁷

Before leaving missionary science it is worth pausing to ask an important question. Does the manner in which missionaries engaged with science differ greatly from the way Christians in Britain engaged with science? Is this global story merely the European narrative that we know so well writ large? In line with the argument by historical geographer David N. Livingstone that spatiality is central to understanding how missionaries generated knowledge, we can appreciate that the results of missionary science differed significantly across the globe, and that missionary science could have a sense of authority because of its location and missionaries' firsthand experience.²⁸

Working with an emphasis on spatiality means that the British history of science and religion needs to be recast in a global context, for missionary knowledge came back home and fed into both popular and elite

debates, inasmuch as scientific theories articulated in Britain were carried by missionaries and reconstituted in the periphery. The question of whether the history of missionary science runs in parallel with the British history of science and religion is not the best question to ask. It is time for us to reconfigure the discipline so that we think of nation, geography, and scientific community in new ways, placing traditional sites for the history of science and religion in a global network and recognizing missionaries as vital agents in the global history of science and religion.

NON-WESTERN REDEFINITIONS OF SCIENCE AND RELIGION

So far this chapter has focussed on the British side of the engagement between science, religion, and the world outside Europe and America. Yet the globalization that resulted from empire led to multiple traditions of science and religion coming into contact in the course of the nineteenth and early twentieth centuries. The global history of science and religion did not enable only Christian missionaries to make new knowledge: a vast number of other peoples need to be brought into this narrative. Their stories are only just beginning to be written. Hindu, Buddhist, and Islamic thinkers, among others, often provided interpretive frameworks for embedding the newly arrived western science. Even as different sciences and religions encountered each other there was also a hardening-up of what counted as science and religion, and a reconceptualization of sciences and religions.

Two regions that have recently attracted attention in relation to these questions are South and South East Asia. Richard Fox Young's work has made a pioneering contribution by studying the intellectual debates between indigenous *pandits*, or scholars, and Christian orientalist about science and religion in nineteenth-century South Asia.²⁹ Young's work reveals how important the Paleyite tradition of evidential theology was to this debate. An informative example is provided by the work of John Muir (1810–82), a complex evangelical who was influenced by the Scottish school of Common Sense philosophy and held various appointments in the north-western provinces of the East India Company's territories between 1830 and 1853.³⁰ Muir also spent a year (1844–5) reorganizing the teaching at Benares Sanskrit College, which had first been established at the end of the eighteenth century in order to propagandize the Company's patronage of indigenous traditions of scholarship.³¹ At the College Muir sought to direct students away from what he saw as unfounded Hindu dogma to verifiable science. Muir's book *Matapariksa*, which first took shape in 1839, was intended to be a Sanskrit Paley: 'A Sanskrit Treatise on the Evidences of

Christianity, with a refutation of Hinduism'.³² The *Matapariksa* contained 379 verses and consisted of a dialogue between a teacher and a student. Throughout, Muir attributed the structure of the physical world to 'the maker'. He also included Paley's argument against the thesis that the world was a dream-like illusion, and he used Paley's explanation of miracles.

What is most interesting about Muir's work is not its form but the response to it by many *pandits*. One interesting example is provided by Somanatha Vyasa (1807–90) of Sajapur, a town near Gwalior, who published at least thirty-six works and who cast himself in the lineage of an ancient astronomical tradition which encompassed such astronomers as Bhaskara.³³ In responding to Muir's work he wrote that Britons were undeniably clever and skilled mechanics, and knew how to apply science to technology. They built steamships for the Ganges and flying machines, which Young suggests could be a reference to hot-air balloons. They were wise in their administration and well versed in economics. Yet they looked for differences where there was congruence. Their minds were clouded by the dogma that creation occurred in the recent chronological past, compared with the Hindu view of eons and cycles of the eternal dharma.³⁴ In his *Matapariksa* Somanatha hoped that his readers would understand the unity and compatibility of Hinduism, Christianity, and indeed all other religions. Young urges that while Somanatha's response to Muir might be seen as an attempt to encompass Christianity within Hinduism, Subaji Bapu sought to do the same for the sciences.

Subaji Bapu was a *pandit* who served another Christian orientalist, Lancelot Wilkinson. Wilkinson, who is sometimes cast as a patron saint of Sanskrit astronomy, spent most of his days in central India. Subaji was of South Indian origin, and we are only able to gain access to his life through his patron: he disappeared after Wilkinson's early death. Wilkinson hoped to weaken the attachment of people to the cosmographic traditions associated with the *Puranas*, the ancient Hindu texts, and so to popular Hinduism, by spreading Copernican philosophy. Wilkinson discussed Copernican astronomy at length with Subaji and believed that he had succeeded in converting him to both Copernicanism and Christianity. He wrote of the long process that brought this about:

The arguments by which I had for the previous eight years of our connection in vain endeavoured to impress on Subaji Bapu a conviction of the truth of the real size and shape of the earth and other important physical facts, now carried to his mind the clearest conviction when shewn to be precisely the same as those of their own astronomical authors . . . He was lost in admiration when he came fully to comprehend all the facts resulting from the spherical form of the earth.³⁵

In 1836 Subaji published his own tract in Marathi, entitled *Siddhantasir-omaniprakasa*, which was subsequently translated into Hindi. Here he sought to explain the correct form of astronomy that he had learned from Wilkinson, and he defended this in an unpublished tract called *Avirodhaprakasa*. But although Wilkinson thought that Subaji had become a Copernican, Young argues that something far more complicated happened during this encounter. The title of Subaji's main work, *Siddhantasiromaniprakasa*, translates as 'An illumination of Siddhantasiromani, the crest jewel of astronomical systems'. In fact Subaji was merely improving on an established work of astronomy written by Bhaskara, the ancient Indian astronomer.³⁶ Subaji thus utilized Copernicanism in order to critique the traditions of astronomy in India and to urge their resuscitation in the light of the advances of European science. Young's important work indicates how the arrival of western science and Christianity in India did not lead to hegemony or to the erasure of existing traditions. Instead, by tracing the intellectual works of learned men in India, it is possible to see how new knowledge was utilized to recast traditional knowledge and to redirect it. Young describes this as a history of 'collaboration, interaction and self-differentiation'.³⁷

The debate surrounding science and religion in Asia often gained public prominence: local peoples often turned at first to western science as a means of testing Christianity; they saw the two as one package. Eclipses were one class of event that generated such public debate. In northern Siam in August 1868 an American Presbyterian missionary, Daniel McGilvary, used a total solar eclipse as an opportunity to debate with Nan Inta, a man who was known to be religious and studious and who had been educated in Buddhism.³⁸ Nan Inta had already had some discussions with McGilvary about geography, the shape of the earth, and the nature of eclipses. But McGilvary had failed to convince him. The eclipse allowed McGilvary to present a public proof of his science, and, by predicting the eclipse correctly, the missionary persuaded Nan Inta that his beliefs about eclipses – that they came about when a 'huge monster devour[ed] the sun' – were inaccurate. Nan Inta then began to read about Christianity at great length and was baptized in 1869, subsequently becoming a leader of the north Thai church. McGilvary wrote: 'The explanation of it [the eclipse] seemed to him so natural and beautiful and rational compared with what their books teach, that it led him to a clear and firm foothold on which he feels and knows that he is safe. And now almost daily he uses the same argument to his countrymen'.³⁹ This conversion story must not be read as the conversion of a 'simple-minded superstitious native' but rather as the outcome of carefully

testing both science and Christianity on the basis of evidence. It was an intellectual struggle.

A very similar debate had occurred in Jaffna in northern Sri Lanka in the 1820s but had resulted in a different outcome.⁴⁰ Daniel Poor, of the American Board of Commissioners for Foreign Mission, entered into a debate with Vicuvanata Aiyar (1756–1845), an elderly brahmin and astrologer. Poor sent him trigonometric problems to solve, and Vicuvanata sent him an ola, a palm leaf on which was written a physiological problem concerning sneezing. The intellectual exchange carried on in this vein. Poor detected errors in Vicuvanata's almanac, which predicted a lunar eclipse on 20 March 1829. Poor printed a tract that alerted the people in his parish to this error, but Vicuvanata stuck to his original prediction. On the night, in front of a crowd of witnesses, Poor won this contest when the predicted eclipse failed to occur. Poor did his utmost to make Vicuvanata his pupil, but it quickly emerged that Vicuvanata was more interested in improving his almanac by adopting the new science rather than making a radical break with his own traditions of religion and science. Moreover, at the college where Poor taught science his students continued to accept astrology. For instance, when Jonathan Magee, a Tamil student who had converted to Christianity, died in a classroom during the inauspicious fifth day of the waning moon, his schoolmates abandoned the institution, and it had to be closed temporarily. So there was no death-blow to indigenous sciences of the sky, merely an appropriation of new ideas from Europe and their recontextualization within existing traditions. These narrations of the uses of and responses to an eclipse demonstrate the need to be careful in discussing the encounter between sciences and religions.⁴¹ In cases that seem at first to be characterized by the adoption or rejection of new knowledge, a more complicated process of accommodation between different sciences and religions often seems to have occurred.

In addition to Hindu and Buddhist perspectives, it is possible to bring in another religious tradition by drawing on recent work on Islamic science in the modern period. With Islamic science it is important to avoid writing of a unitary tradition; instead there were multiple paths of engagement, which should be contextualized within the modernization of the Middle East in the face of western advances. The reform of the Ottoman empire led to a period of institutional reorganization in the mid-nineteenth century termed *tanzimat*, which saw the opening of numerous schools and academies teaching western science. This in turn led to a programme of reinvigoration for the traditional *madrasa* and the

translation of sections of texts on western science into Arabic and Turkish. In parallel with this movement of reform was a set of principles, exemplified for instance by Wahhabism, which sought to return the Middle East to what was said to be pure Islam, and so to reject the West and its sciences. The multiple paths of modernization that arose in this context can be discerned in the growing historiography on this topic. Scholars have identified thinkers who hoped to embrace Christian science in order to forge a westernized or even secularized philosophy, those who sought to modernize Islam in the light of science, and also those who used science in order to bolster traditional Islamic thought.

The classic work of Albert Hourani provided an early commentary on the placement of science in the modernizing propensities of Arabic thought: Middle Eastern intellectuals embraced Christian science, alongside liberal political thought and nationalism, in order to reform the Middle East.⁴² For instance Butrus al-Bustani (1819–83) was educated in a Maronite community in Egypt and became closely linked to American Protestant missionaries, whose faith he accepted. Bustani then formed his own school, where the sciences and the Arabic language were taught. He believed that the Middle East could revive itself only by accepting the knowledge of European discoveries, and so from 1876, with the financial help of Khedive Isma'īl, he began to issue a vast encyclopaedia, of which eleven volumes were published, full of science, medicine, engineering, and the liberal ideas of Europe.⁴³ Hourani also paid attention to a generation of Lebanese Christians who in the 1870s adopted the political newspaper and the scientific periodical in order to show Arabs the ideas and inventions of Europe and America. They assumed that the western sciences were universal and that they could readily be communicated in Arabic. One individual who came directly under the sway of these publications was Shibli Shumayyil (1850–1917), a graduate of the Syrian Protestant College. He wrote a small book in 1896, the *Shakwa wa amal*, where he expounded his view of what was wrong with the Ottoman empire. Instead he preferred the ideologies of science, justice, and liberty. For Shumayyil, Huxley, Spencer, and Darwin symbolized all of science; his enthusiasm for evolution was linked to a philosophical materialism.⁴⁴ Like Shumayyil, a number of other writers took science on board in order to bolster their positions as either Christians or secularists.

Shumayyil's enthusiasm for Darwin's work can be contextualized within the broader controversy at the Syrian Protestant College about the status of Darwinism. The history of this college shows how the new science provided intellectual resources for conversion from one religion to

another, for the reassertion of religious faith, and also, somewhat contradictorily, for the division of existing religious communities. As Marwa Elshakry has recently shown, in 1882, when Edwin Lewis, a Harvard graduate and Professor of Geology and Chemistry, gave the annual graduating speech at the Syrian Protestant College in Arabic and spoke in favour of Darwinism, he unleashed a debate about what counted as good science.⁴⁵ His speech was published in *al-muqtataf* or 'The Digest', a journal of 'science and industry' published by the college. Responses and rejoinders soon followed. In the end Lewis had to resign, as did a number of others associated with the college. Darwinism's importance to the missionary movement is underscored here. Yet its ambiguous status within missionary discourse meant that a space was opened for non-European elites to appropriate science for their own ends. For Darwinism did not necessarily lead to Christianity and westernization: some used it as a tool to reform Islam. Thus Husayn al-Jisr (1845–1909), who frequented the college library and served as director of 'The Sultan's School' in Beirut, sought to use Darwin to reinforce Islam by citing several Qu'ranic verses which held that life began in water.

John W. Livingston and S. Irfan Habib also show how Islamic scholars could divorce western science from its Christian framework and lead to a reassertion of Islam. Livingston focusses on an important Egyptian intellectual and political thinker, Rifa'a al-Tahtawi (1801–73). Tahtawi called for Muslim society and in particular al-Azhar, the famous educational institute first founded in the tenth century, to embrace western science. Tahtawi became enamoured of western science while studying in Paris. Livingston argues that the evolution of his thought about scientific method is too complex to classify him as a synthesizer: 'he was an apologist, a reformer and a pragmatist, a man of action helping to educate the modernizing state, while doing what he could to temper modernity with the comforting familiarity of religion'.⁴⁶ For instance Tahtawi saw the embrace of western science as a process of repossession of what was originally Islamic. He also urged those with fragile minds, who were not steeped in the Qur'an and sunna, to leave the study of science to others, for their beliefs would become diluted. He accepted various facts about the physical world that were derived from western science and recontextualized them within Sunni thought. It is important to note that he did not aim at a grand synthesis of science and religion but instead adopted a pragmatic and piecemeal acceptance of empirical evidence.

This stance with respect to science and religion is also nicely exemplified by two Indian Muslims: Syed Ahmad Khan (1817–98), a reformer who founded the Aligarh Muslim University and who sought to position

Indian Muslims as loyal to the Raj, and Jamal al-Din al-Afghani (1839–97), who was an anti-imperialist pan-Islamist.⁴⁷ Syed Ahmad controversially advocated that the Qur'an be reinterpreted in the light of physical realities; for him religion was not a corpus of tradition but rather had to be remoulded to fit current human experience. Afghani did not seek to reinterpret Islamic theology; instead his anti-imperialism led him to view science not as western but as universal.

Arabic and Islamic engagements with science in the nineteenth century were framed by the long history of science in the Middle East, and also by the felt need to reform and modernize in the face of western imperial expansion. Within this tradition it is difficult to trace a straightforward narrative of the absorption of new ideas from the West or to classify different types of thinker as synthesizers or revivalists. To varying degrees reformers sought to contextualize science within existing frameworks and alternative political goals. In this new age of globalization the multiple intellectual resources open to Islamic and Arabic thinkers meant that different figures were able to forge their own trajectories, ranging from westernization to Islamism. While the world of the Middle East and of Islam more widely, as well as the Hindu and Buddhist cultures of South and South East Asia, had well-institutionalized traditions of education, different historical methods become necessary when we widen our gaze to the regions of the Pacific and Africa. In the Pacific one way in which to appreciate how islanders responded to the scientific instruments, books, and practices that Christian missionaries brought with them is to pay attention to visual images or to read missionary sources against the grain.

For instance Protestant missionaries were emphatic about the need to train islanders to be industrious agriculturalists. But a delegation of evangelicals who visited South Pacific mission stations in the 1820s noted how one inhabitant of the island of Huahine had planted a nail, as a rare object made of metal, hoping that it would bud, blossom, and fruit.⁴⁸ Likewise an illustration in a mid-nineteenth-century printed source shows eight Micronesian islanders eating a packet of mail that had landed on shore, thus adopting a very different view of the physicality of paper.⁴⁹ It is difficult to decide on the veracity of these accounts and images, yet they suggest how scientific artifacts could have been reinterpreted in local contexts. William Wyatt Gill, the missionary we encountered earlier, compiled a collection of natural history anecdotes used by islanders. For instance one islander announced: 'We poor sinners are like the *titi* – a foolish bird – hiding in the dark noisome haunts of sin'.⁵⁰ The use of the *titi* bird here is

reminiscent of traditional natural theology tropes in missionary sermons. Yet at the same time the *titi* already possessed significance in Polynesia; for instance in Tahiti a slave was called *titi*. Did the islander then speak of conversion using an already existing tradition of natural historical analogy which was then transposed to a Christian one? In the Pacific the arrival of both Christianity and science did not lead to a straightforward appropriation of new ideas. There was a significant amount of creativity in how Pacific islanders recast existing traditions and responded to the new.

Cultural history is also vital in coming to terms with how Africans responded to the amalgamation of Christianity and science, as demonstrated in Luise White's fascinating work on the history of rumours of blood-sucking in twentieth-century East and Central Africa. White writes of how Africans responded to the medical mission: pills were seen as charms, and the bottles in which lotions were given were not returned. Albert Cook, one of the medical missionaries of the Church Missionary Society, expressed exasperation at how Ugandans responded to his medicines and provided a typical consulting-room dialogue:

- DOCTOR: What is the matter with you?
 PATIENT: My name is so and so.
 DOCTOR: Yes, but what is your disease?
 PATIENT: I want medicine to drink.
 DOCTOR: Where do you hurt?
 PATIENT: I don't want medicine to swallow, but to drink.
 DOCTOR (STERNLY): What is your illness?
 PATIENT: Oh it goes all over me, it cries out 'Ka Ka'. Will you listen to the top of my head with your hearing machine etc. etc.?⁵¹

Using evidence like this, White reinterprets the long queues of patients who attended medical missionary clinics. He writes that they do not signify a real interest in western medicine but rather how these medical objects and remedies were recontextualized in African healing practices.

It is important not to cast the experience of Pacific islanders and Africans in opposition to the inhabitants of South Asia and the Middle East. The general argument that has been proposed is that in all of these regions Christian and scientific practice was not merely appropriated or rejected wholesale. A far more complicated process of accommodation and evolution needs to be traced, where non-Europeans are given both intellectual and cultural agency and where existing local traditions of science and religion are respected. The globalization of science and religion in the wake of the British empire saw different traditions come into more sustained contact than before and provided the resources for different religious

and scientific traditions to reinvent themselves. With the emergence of nationalist movements across these territories such newly resurgent ideas became increasingly linked to a shared political programme. For example, as the work of Gyan Prakash shows for India, Hindu nationalists utilized a vocabulary of science in order to bolster their political campaigns.⁵² Sciences and religions in the non-European world therefore absorbed the new, went through a long process of negotiation, and then repositioned themselves as distinct ideologies.

TOWARDS A GLOBAL UNDERSTANDING
OF SCIENCE AND RELIGION

By tracing a global history of science and religion for territories that loosely came under British influence this chapter has attempted to stretch the boundaries of the traditional Eurocentric and Protestant-focussed history of science and religion. It has provided a general view of some of the common themes that arise when different religious traditions respond to new sciences in the context of colonialism and has pointed to exchange and redefinition as crucial. The evidence offered shows that there was no necessary conflict between sciences and religions. At the same time a simple model of complementarity does not recover the complexity of this story either.

The discussion has focussed on both colonizers and colonized by bringing to view Christian missionaries and non-western elites as examples of the types of individual who might be brought into a global history of science and religion. All of the figures discussed in this chapter – ranging from missionary evangelists to missionary anthropologists, and the *pandits* of South Asia to Pacific islanders – are not those traditionally considered as participants in the history of science and religion. Yet because these individuals lived in the context of colonialism, they had to come to terms with new scientific and religious ideas or redefine existing knowledge. At first glance their biographies may appear rather different from those figures who are better known in the modern history of science and religion, namely clergyman natural historians or pious professional scientists. Yet the scope of a global history of science and religion might be broadened beyond that of this chapter by contextualizing leading figures in the history of European and American science and religion within a larger picture of intellectual patterns and connections across the world.

The geographical ambit of this chapter does not necessarily signal a turn to pluralism but rather to the possibility of drawing out a bigger picture that brings to view the movement of ideas, people, and information. While

much of the work in the new global history of science and religion has been restricted to a few specific geographical areas, if a wider perspective is adopted it may be possible to link stories by means of people and artifacts that move across the world. The generalization about science and religion that is proposed in this chapter is represented by the possibility of writing a connected narrative about the intellectual encounters of the British empire. This does not, however, preclude the fact that there were disconnections in the circulation of sciences and religions. Connected histories will need to work alongside comparative ones. Yet a big picture of science and religion may circumvent the fragmentation of the discipline, and for that reason we should work hard at it. Since this chapter has taken a larger view, it has been possible to get a sense of the redefinitions of science and religion in this period of global contact and movement. Sciences and religions had complex engagements, rather than ones characterized only by conflict or complementarity. Yet an argument for complexity should not lead automatically to a dominance of case studies.

The need for more work in the global history of science and religion is underscored by the rich sources that are available for its study: Hindu, Buddhist, and Islamic intellectuals wrote works on science; and the textual and visual archive of the colonizers can be taken apart in order to get to how Pacific islanders and Africans, for instance, repositioned religious science. In all of these ways there are telling signs that the project of writing the history of science and religion for the nineteenth and twentieth centuries has just begun. Such a programme of research, which pays due attention to the whole world and also to all religious and scientific cultures, will no doubt widen our understanding of why different sciences and religions could provide new opportunities and reinforcement to each other. We have only got the first flavour of the global encounter of sciences and religions.

NOTES

- 1 Sujit Sivasundaram, *Nature and the godly empire: Science and evangelical mission in the Pacific, 1795–1850* (Cambridge: Cambridge University Press, 2005), Conclusion.
- 2 Sujit Sivasundaram, 'Man, nature and British missionaries in the Pacific, 1820–1880', unpublished MPhil thesis, University of Cambridge (1998), pp. 22–3.
- 3 Niel Gunson, 'British missionaries and their contribution to science in the Pacific Islands', in Roy M. McLeod and Philip F. Rehbock (eds.), *Darwin's laboratory: Evolutionary theory and natural history in the Pacific* (Honolulu: University of Hawaii Press, 1994), pp. 283–316. See also John Stenhouse,

- 'Missionary science', in David N. Livingstone and Ronald L. Numbers (eds.), *Modern science in national and international context* (New York: Cambridge University Press, in press).
- 4 Sivasundaram, 'Man, nature and British missionaries', p. 51. For more on Brown, see Helen Bethea Gardner, *Gathering for God: George Brown in Oceania* (Dunedin: Otago University Press, 2006).
 - 5 Sivasundaram, 'Man, nature and British missionaries', p. 56.
 - 6 Anna Johnston, *Missionary writing and empire, 1800–1860* (Cambridge: Cambridge University Press 2003).
 - 7 Gareth Griffiths, 'Popular imperial adventure fiction and the discourse of missionary texts', in Jamie S. Scott and Gareth Griffiths (eds.), *Mixed messages: Materiality, textuality, missions* (New York: Palgrave Macmillan, 2005), pp. 51–66.
 - 8 Felix Driver, *Geography militant: Cultures of exploration and empire* (Oxford: Oxford University Press, 2001).
 - 9 Details for this paragraph taken from John MacKenzie, *David Livingstone and the Victorian encounter with Africa* (London: National Portrait Gallery, 1996); Clare Pettit, *Dr. Livingstone I presume? Missionaries, journalists, explorers and empire* (London: Profile, 2007); and Tim Jeal, *Livingstone* (London: Yale University Press, 1973).
 - 10 Nicholas Thomas, *Entangled objects: Exchange, material culture and colonialism in the Pacific* (Cambridge, MA: Harvard University Press, 1991).
 - 11 Sujit Sivasundaram, "'A Christian Benares": Orientalism and science in the Serampore Mission of Bengal', *Indian Economic and Social History Review* 44 (2007), III–45.
 - 12 Annie Coombes, *Reinventing Africa: Museums, material culture and popular imagination in Victorian and Edwardian England* (New Haven, CT: Yale University Press, 1994), pp. 174–86.
 - 13 *Ibid.*, p. 184.
 - 14 See, for instance, Jane Samson, 'Ethnology and theology: Nineteenth-century mission dilemmas in the South Pacific', in Brian Stanley (ed.), *Christian missions and the enlightenment* (Grand Rapids, MI: Eerdmans, 2001), pp. 99–123; Helen Tilley and Robert Gordon (eds.), *Ordering Africa: Anthropology, European imperialism and the politics of knowledge* (Manchester: Manchester University Press, 2007); George Stocking, *After Tylor: British social anthropology, 1888–1951* (London: Athlone, 1996).
 - 15 The following material is drawn from Patrick Harries, 'Anthropology', in Norman Etherington (ed.), *Missions and empire* (Oxford: Oxford University Press, 2005), pp. 238–60.
 - 16 Stanley (ed.), *Christian missions and the enlightenment*.
 - 17 For missionaries and class, see Susan Thorne, *Congregational missions and the making of an imperial culture in nineteenth-century England* (Stanford, CA: Stanford University Press, 1999).
 - 18 Mark W. Graham, "'The enchanter's wand": Charles Darwin, foreign missions, and the voyage of H. M. S. *Beagle*', *Journal of Religious History* 31 (2007), 131–50.

- 19 Ronald L. Numbers and John Stenhouse (eds.), *Disseminating Darwinism: The role of place, race, religion, and gender* (Cambridge: Cambridge University Press, 1999).
- 20 See Marwa Elshakry, 'The gospel of science and American evangelism in late Ottoman Beirut', *Past and Present* 196 (2007), 173–214.
- 21 John Stenhouse, 'Darwinism in New Zealand', in Numbers and Stenhouse (eds.), *Disseminating Darwinism*, pp. 61–90, on p. 65.
- 22 Norman Etherington, 'Education and medicine', in Etherington, *Missions and empire*, pp. 261–84, esp. p. 279. For more on missionary medicine, see Terence Ranger, 'Godly medicine: The ambiguities of medical mission in South-Eastern Tanzania, 1900–1945', in S. Feierman and J. M. Janzen (eds.), *The social basis of health and healing in Africa* (Berkeley, CA: University of California Press, 1992); M. Worboys, 'The colonial world as mission and mandate: Leprosy and empire, 1900–1940', *Osiris* 15 (2000), 207–18.
- 23 Megan Vaughan, *Curing their ills: Colonial power and African illness* (Stanford, CA: Stanford University Press, 1991), ch. 3.
- 24 Udo Bude, 'The adaptation concept in British colonial education', *Comparative Education* 19 (1983), 341–55.
- 25 David Wright, *Translating science: The transmission of western chemistry into late imperial China* (Leiden: Brill, 2000), ch. 3. For missionary work and science in China, see also Fa-ti Fan, *British naturalists in Qing China: Science, empire and cultural encounter* (Cambridge, MA: Harvard University Press, 2004).
- 26 Wright, *Translating science*, Appendices 3 and 4.
- 27 *Ibid.*, p. 78.
- 28 David N. Livingstone, 'Scientific inquiry and the missionary enterprise', in Ruth Finnegan (ed.), *Participating in the knowledge society: Researchers beyond the university walls* (Basingstoke: Palgrave Macmillan, 2005), p. 51. For a broad narrative of missionary science, see also Stenhouse, 'Missionary science'.
- 29 Richard Fox Young, *Resistant Hinduism: Sanskrit sources on anti-Christian apologetics in early nineteenth-century India* (Vienna: Institut für Indologie der Universität Wien, 1991); Richard Fox Young and G. P. V. Somaratna, *Vain debates: The Buddhist–Christian controversies of nineteenth-century Ceylon* (Vienna: De Nobili Research Library, 1996); and Richard Fox Young, 'Receding from antiquity: Hindu responses to science and Christianity on the margins of empire, 1800–1850', in Robert Frykenberg (ed.), *Christians and missionaries in India: Cross-cultural communication since 1500* (Grand Rapids, MI: Eerdmans, 2003), pp. 183–222.
- 30 The material that follows is drawn from Young, *Resistant Hinduism*, ch. 4.
- 31 See Michael Dodson, 'Re-presented for the pandits: James Ballantyne, "useful knowledge", and Sanskrit scholarship in Benares College during the nineteenth century', *Modern Asian Studies* 36 (2002), 257–98, esp. 271ff.
- 32 Cited in Young, *Resistant Hinduism*, p. 63.
- 33 Young, 'Receding from antiquity', pp. 210ff.
- 34 This description given in *ibid.*, p. 213.
- 35 Young, *Resistant Hinduism*, pp. 83–4.

- 36 Young, 'Receding from antiquity', p. 198.
- 37 Ibid., p. 217. For work that follows Young's lead, see: Michael Dodson, *Orientalism, empire and national culture, India, 1770–1880* (Basingstoke: Palgrave Macmillan, 2007); Indira Viswanathan Peterson, 'Tanjore, Tranquebar and Halle: European science in German missionary education in the lives of two Indian intellectuals in the early nineteenth century', in Frykenberg, *Christians and missionaries*, pp. 93–126. See also Indira Peterson, 'The cabinet of King Serfoji of Tanjore: A European collection in early-nineteenth-century India', *Journal of the History of Collections* 11 (1999), pp. 71–93. My own work also follows that of this group of scholars: see Sivasundaram, 'A Christian Benares'.
- 38 Herbert R. Swanson, 'Origins of the nineteenth-century transformation of cosmology in Northern Siam: The Nan Inta–McGilvary debates of science and religion', *Journal of the Siam Society* 89 (2001), 32–9.
- 39 This and the quotations that follow are from Swanson, 'Origins', 35–7.
- 40 This paragraph relies on R. F. Young and S. Jebanesan, *The Bible trembled: The Hindu–Christian controversies of nineteenth-century Ceylon* (Leiden: Brill), ch. 2.
- 41 For another account of the uses of an eclipse, see Elshakry, 'The gospel of science', 202–3.
- 42 Albert Hourani, *Arabic thought in the liberal age, 1798–1939* (Oxford: Oxford University Press, 1932).
- 43 Ibid., pp. 99–102.
- 44 Ibid., p. 248.
- 45 The material for this paragraph draws on Elshakry, 'The gospel of science'.
- 46 John W. Livingston, 'Western science and educational reform in the thought of Shaykh Rifa'a al-Tahtawi', *International Journal of Middle East Studies* 28 (1996), 543–64, on 554.
- 47 S. Irfan Habib, 'Reconciling science with Islam in 19th-century India', *Contributions to Indian Sociology* 34 (2000), 63–92, on 64. For a broader, general account of Islam and science encompassing these individuals and others, see Muzaffar Iqbal, *Islam and Science* (Aldershot: Ashgate, 2002).
- 48 Sivasundaram, *Nature and the godly empire*, p. 161.
- 49 Vanessa Smith, *Literary culture and the Pacific: Nineteenth-century textual encounters* (Cambridge: Cambridge University Press, 1998), pp. 237–8.
- 50 Sivasundaram, *Nature and the godly empire*, p. 92.
- 51 Cited in Luise White, *Speaking with vampires: Rumor and history in colonial Africa* (Berkeley, CA: University of California Press, 2000), p. 97; quoted passage from Cook's diary of 1900.
- 52 Gyan Prakash, *Another reason: Science and the imagination of modern India* (Princeton, NJ: Princeton University Press, 1999).