

## ESSAY REVIEW

# The history of science and the global turn of the screw

James Poskett, *Horizons: A Global History of Science*

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In his later years, the Soviet physicist Lev Landau kept a running list of the greatest figures in his field, rating their significance and achievement on a logarithmic scale from 0 to 5. Those ranked a 5 were judged ‘pathological’, Landau’s favourite epithet for trivial or flawed work. He placed himself at 2.5, which he later nudged up to 2. At the rank of 1 were pivotal figures in the early development of quantum mechanics, including Niels Bohr, Werner Heisenberg, Enrico Fermi, Paul Dirac and Erwin Schrödinger. Alongside them, Landau positioned Satyendra Nath Bose.

Today, Bose is considerably less widely known than almost all of the others in his category. People are more likely to have heard of bosons, the class of subatomic particles, than of the Indian theoretical physicist after whom they are named. By Landau’s measure, though, only Einstein and Newton, who occupied the two top spots with respective rankings of 0.5 and 0, could be considered more significant than Bose in the entire history of physics.

Both Landau and Bose feature among the hundred short biographies of figures from the history of science assembled by James Poskett in *Horizons*. The book connects the lives of a mix of Europeans working outside Europe, non-Europeans and Europeans working inside Europe who relied on knowledge and ideas from elsewhere, and folds them into one narrative spanning from the fifteenth century to the present. The geographical distribution of these figures, Poskett argues, did not stop them from being part of the same historical trajectory: the gradual emergence of modern science. In fact, he writes, the latter rested completely on the former.

*Horizons* sets out to show that the reliance of scientific work on the collaboration of people in different parts of the world is neither a recent phenomenon nor one that emerged in the twentieth century when Landau and Bose were active. It has been the core dynamic of scientific development since the colonization of the Americas. While noting that there was nothing new about trading, religious or diplomatic networks connecting scientific thinkers in different places and leading to the spread of ideas, *Horizons* focuses on the ways in which the forces unleashed by European commercialism and imperialism dramatically expanded and intensified circulations of knowledge, producing successive revolutions in the ways people thought about the natural world.

Poskett's argument as laid out here is also concerned, in a way, with ranking. Whereas Landau ranked mainly for fun (or perhaps out of compulsion, since he was known to classify all aspects of his life), the historiographical primacy of Europe in the history of science has always had a sharply ideological edge.<sup>1</sup> The Cold War boosted the tendency to frame the world through an East–West divide just at the moment when the history of science became established as a field. This implanted within it for decades, writes Poskett in the introduction, a mission to elevate the achievements of Western civilization and credence that modern science was a European invention. 'The Cold War is over', he ends, 'but the history of science is still stuck in the past' (p. 6).

To come unstuck, Poskett suggests, the field must grapple with those who have been left out. This is where Bose and Landau, alongside such diverse figures as Ulugh Beg, Xu Guangqi, Graman Kwasimukambe, Nikolai Daurkin, Tanakadate Aikitsu, Chandrasekhara Venkata Raman and Elisabeth Goldschmidt, come in. *Horizons*, though, is not just about recognizing their individual contributions; it is about reframing the history of science as a global history, made not in one place, but everywhere. It is about viewing modern science as a shared co-creation, an interconnected human effort, rather than uniquely European in its origins.

The story is organized in four sections that follow what Poskett describes as 'key moments in global history' (p. 356). The first section, from the mid-fifteenth century to the end of the seventeenth, is defined by the colonization of the Americas and the expansion of trade and religious networks. The second section, from the mid-seventeenth century to the end of the eighteenth, covers the burgeoning of European imperialism and the slave trade. The third section, from 1790 to the eve of the First World War, is the period of capitalism, nationalism and war. The fourth and final section confronts the Cold War and decolonization. We have now, Poskett suggests in the epilogue, entered a fifth period, a 'New Cold War' delineated by nationalism and globalization, with artificial intelligence, space exploration and climate science all providing examples of these twin forces in action.

Each section has two chapters, starting with 'New Worlds', a broad overview of the influx of knowledge from the Americas in the hundred years after Christopher Columbus landed in the Bahamas. Europeans were not simply strip-mining raw information, Poskett stresses, but were absorbing from existing bodies of knowledge ways of thinking about how to research, organize and represent ideas about the natural world. 'Heaven and Earth', the second chapter, positions Nicolaus Copernicus's radical heliocentric model of the universe as the result of his encounters with astronomical texts from outside Europe, before tracing the ways in which astronomers in the Ottoman, Songhay, Ming and Mughal empires similarly brought together cosmological knowledge from East and West. 'This was a global scientific revolution', Poskett writes, that followed directly on from 'a global Renaissance' (pp. 52, 92).

In Chapters 3 and 4, the Enlightenment is similarly characterized as a global movement. 'Newton's slaves' begins with Isaac Newton's involvement in the Atlantic slave trade, before exploring how his ideas spread through imperialism and commercialism, giving rise to 'European explorers [who] combined Newtonian science with Indigenous knowledge' (p. 129). In 'Economy of nature', the emergence of Linnean taxonomy is linked to parallel developments in ordering knowledge of nature in places like Japan, which is portrayed as undergoing its own Enlightenment during this time, and in colonized South East Asia and the Caribbean.

One by one, these historical periodizations and markers of scientific change – the Renaissance, the Scientific Revolution, the Enlightenment – are not just broadened. They

<sup>1</sup> Vitalii Isosifovich Goldanskii, 'In the kaleidoscope of memory', in I.M. Khalatnikov (ed.), *Landau, the Physicist and the Man: Recollections of L.D. Landau*, Oxford: Pergamon Press, 1989, pp. 136–42, 138.

are reclaimed from recent critiques of their validity in their original European historical contexts, and reinforced in a chronological structure that sees the whole world becoming modern.<sup>2</sup> This temporal adjustment allows West and non-West to be placed on a shared timeline of discovery and development, but one in which globalization made modern science possible, rather than one in which Westernization spread the endogenous achievements of Europe to the rest of the world. It is also a structural adjustment that denies it status as a simple story of progress, opening up instead a focus on modern science's entanglement with systematic violence.

So it is with the Darwinian revolution. Chapter 5, 'Struggle for existence', sees the old natural history 'give way to a new era of evolutionary thought' determined by a global environment of deepening conflict, nationalism and colonial domination (p. 178). As the worldwide impact of industrialization on physics and chemistry is traced in Chapter 6, 'Industrial experiments', James Clerk Maxwell's unification of electromagnetism is told as a unification of scientists across the world, whose work in these fields was inextricable from empire, capitalism, international politics and war. The Einsteinian revolution, with its 'complete rejection of the earlier world of Newtonian physics' and progression to a new stage of cosmology, is similarly inseparable from upheavals in national and international politics in the seventh chapter, 'Faster than light' (p. 264). Finally, in Chapter 8, 'Genetic states', different strands of development in the field of genetics are intertwined with twentieth-century nation building.

If these successive breakthroughs and the evolving metacontext of modern globalization are indivisible, then the message of *Horizons* is clear: 'to understand the history of modern science, we need to think in terms of global history' (p. 259). The individual biographies that make up the book are carefully chosen not just for their diversity and evocativeness, but also for their traction within and beyond recent and ongoing scholarship. For example, research on Francis Williams, who features at the end of Chapter 3, conducted since the book's publication, suggests that he used Newtonian mechanics to independently calculate and observe from Jamaica the return of Halley's Comet in 1759.<sup>3</sup> The 'whiskey' developed by Takamine Jōkichi in the 1890s, described in Chapter 6, that accelerates the fermentation process by using *kōji*, a species of mould, in place of malt, has recently gone on sale to the public for the first time.<sup>4</sup>

This assembly of characters is the book's most impressive feat. Yet, underneath their stories, is a tension at its heart. It strains between its mission to expand the field of the history of science outward from Europe and its systematic universalization of narratives, concepts, categories and themes developed to describe European history, but which here serve as frameworks for the inclusion of the rest of the world.

This tension manifests in multiple ways. *Horizons* regularly reminds us that we need to look elsewhere, but its route in is often a familiar European face. The first section on China starts with Matteo Ricci, for example, and the Inca Empire with Charles-Marie de la Condamine. Where the introductions to different places come via non-Europeans, they are frequently rulers – kings, emperors, sultans, shoguns and so on. These were the very people who dealt most directly with the growing forces of Western power around which Poskett draws his global historical big picture, yet also the very people likely to be least representative of the societies around them. Since these introductory paragraphs generally provide local or regional context, all context is now global context.

<sup>2</sup> See, for example, James A. Secord, 'Against revolutions', *BJHS Themes* (2024) 9, pp. 17–37.

<sup>3</sup> Fara Dabhoiwala, 'A man of parts and learning', *London Review of Books* (2024) 46 (22), pp. 22–27.

<sup>4</sup> Florence Fabricant, 'To sip: koji-fermented whiskey comes to the U.S.', *New York Times*, 2 February 2022, section D, p. 3.

Definitions of context are changing in the history of science, and *Horizons* represents a deliberate turn to highlight larger rather than smaller scales, and to reframe connection and circulation as their own forms of context.<sup>5</sup> Yet it produces another form of insularity – and another manifestation of the tension inherent within the book and the model of global history of science that it advocates. It emphasizes connection beyond local, national and regional scales, yet, to show that the world played a role in the familiar beats of scientific history, the world is divided into national and regional units that are repeatedly related back to Europe. The primary significance of the knowledge produced by eighteenth-century Japanese naturalists like Kaibara Ekken, Katsuragawa Hoshū and Nakagawa Junan, for example, becomes its impact on the travelling Swedish botanist Carl Peter Thunberg, a former student of Carl Linnaeus.

Developments that Europeans did not take up – consider the discovery of a prophylactic against decompression sickness in late nineteenth-century Oceania that was widely adopted by divers in the region – are acutely susceptible to marginalization within this global history.<sup>6</sup> They do not fit its chronology. The conditions that enabled them were not modern in a sense understood in European history, and, in a story of the many ‘scientific cultures’ that fed into and eventually became ‘modern science’, they end up outside this central trajectory (p. 356). Sub-Saharan Africa and Oceania and the Pacific, which virtually disappear from *Horizons* after the eighteenth century, are particularly poorly served by this global history.

The inherent tension of its global methodology means also that *Horizons* gives science a human face, but less so a historical epistemology. A map given to James Cook and Joseph Banks by the Tahitian navigator–priest Tupaia in 1769 becomes an emblem of collaboration and complementarity, combining ‘European and Polynesian navigational techniques’ in a chart of Pacific islands that, Poskett emphasizes, ‘certainly all existed’ (p. 123). The original copy of the map is lost, however, and the separate island lists that survive contain, in Anne Salmond’s words, ‘cosmological features that, from a European point of view, were not real’.<sup>7</sup> Difference existed not simply in the representation of knowledge, but in the perception of reality which knowledge expressed, and the ways in which that knowledge related to social, cultural and political institutions, or the lack thereof.

*Horizons* never deals with the issues of mutual intelligibility that this raises. It is not just, however, that an approach focused on parallels, similarities and complementarity with Europe leaves it insufficiently attuned to the specificities of the non-European systems of knowledge within which ideas and practices were active. It also fails to engage with the potential to universality held by other knowledge systems. That route only seems to come through entanglement with European modernity. The tension finally manifests, then, as the perpetuation of a Eurocentric historical imagination of the world that goes far beyond the belief that science was a European creation. European elites by the eighteenth and nineteenth centuries often thought of themselves as being at the centre of the world of knowledge, designating regions the Middle East, Far East, East Indies and West Indies to express their peripherality. But they were not.

The terms of global history that *Horizons* encourages us to think in foreclose the inclusion of important historical developments that demonstrate the non-centrality of Europe. Evolutionary theory in Japan was not fixed, as suggested in Chapter 5, to a framework of

<sup>5</sup> See Kapil Raj, ‘Beyond postcolonialism ... and postpositivism: circulation and the global history of science’, *Isis* (2013) 104 (2), pp. 337–47.

<sup>6</sup> Manimporok, ‘Transnational subjectivity in the Pacific Ocean’, *Irish Studies in International Affairs* (2024), ahead of print, DOI: 10.1353/isia.0.a946987.

<sup>7</sup> Anne Salmond, ‘Star canoes, voyaging worlds’, in Willard McCarty, Geoffrey E.R. Lloyd and Aparecida Vilaça (eds.), *Science in the Forest, Science in the Past: Further Interdisciplinary Explorations*, London: Routledge, 2022, pp. 53–68, 58.

competition and struggle that corresponded the lives of non-human species to the global conditions of imperialism, capitalism, militarization and international politics in the late nineteenth century and the early twentieth. A significant body of Japanese scientific work explained evolution through mechanisms of cooperation, symbiotic relationships, culture formation and even empathy within a natural world that was understood as interdependent with our species, rather than separate.<sup>8</sup> The reading and translation into Japanese of Russian scientific writers, such as Ilya Mechnikov and Peter Kropotkin, was critical to the development of these ideas – a non-Western cross-cultural connection that goes unrecognized even though these very figures are mentioned in the section directly prior to the one on Japan. Connections like this do not fit the ascribed global context. It may be time for the field to draw a stronger distinction, then, between what we might describe as transnational history of science, which is able to look outside the Eurocentric world order of empires and nation states to make sense of developments, and global history of science.

The history of science need not and should not retreat to the scale of area studies. In several respects, *Horizons* provides an opportunity for historians of science, students and general readers alike to think about the past, present and future of the field. One of these is by placing an excellent array of historical scholarship in conversation – including the work of Claudia Zaslavsky, Carla Nappi, Anne Salmond and many, many more. Some of these scholars may not consider themselves historians of science, and still more do not use the categories that Poskett employs, such as the Enlightenment, to describe their historical narratives and actors. Yet, in a book about connections, the connections that are spread between these works are valuable. We must push further and draw together different parts of the world while pursuing new ways of thinking about how historical studies of science can be done.

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<sup>8</sup> Sho Konishi, *Anarchist Modernity: Cooperatism and Japanese-Russian Intellectual Relations in Modern Japan*, Cambridge, MA: Harvard University Press, 2013, pp. 296–327; Clinton G. Godart, *Darwin, Dharma, and the Divine: Evolutionary Theory and Religion in Modern Japan*, Honolulu: Columbia University Press, 2017, pp. 119–56.