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Introduction: have we ever been 'transnational'? Towards a history of science across and beyond borders

SIMONE TURCHETTI*, NÉSTOR HERRAN† AND SORAYA BOUDIA‡

Abstract. In recent years, historians have debated the prospect of offering new 'transnational' or 'global' perspectives in their studies. This paper introduces the reader to this special issue by analysing characteristics, merits and flaws of these approaches. It then considers how historians of science have practised transnational history without, however, paying sufficient attention to the theoretical foundations of this approach. Its final part illustrates what benefits may derive from the application of transnational history in the field. In particular, we suggest looking at the construction of transnational networks in science, and discuss some of the methodological consequences of adopting this approach.

Can the history of science be transnational? The question may appear rather trivial as the discipline has always striven for a global reach. However, it becomes more challenging if one considers that what the transnational history of science is really about is yet to be debated. Science has been depicted by historians as an important tool of colonialism, imperialism and international diplomacy; scientists have been portrayed as key actors in international mobilizations such as nuclear disarmament and environmentalism; and the circulation of scientific instruments, workforce and ideas globally has come increasingly into focus. Yet, against this background of international activities, few scholars have reflected on trends in recent historiography and on what analytical tools should (or could) be made available in order to embrace a transnational perspective. In brief, what is missing is a reflection about what this viewpoint has got to offer to practitioners.

In order to consider the role transnational history has played (and might play in the future) in the historical studies of science, we have put together a set of contributions that analyses this issue. John Krige, John Melling, Lewis Pyenson, Christopher Sellers and Mark Walker have answered our appeal to promote a discussion. Dominique Pestre has kindly agreed to write some concluding remarks. We are extremely grateful to them all for their efforts and contributions.

* Centre for the History of Science, Technology and Medicine (CHSTM), University of Manchester, Manchester, M13 9PL, UK. Email: simone.turchetti@manchester.ac.uk.

† Université Pierre et Marie Curie, 75252 Paris, France. Email: nestor.herran@upmc.fr.

‡ Institut de recherche sur les sciences et la technologie (IRIST), University of Strasbourg, 7 rue de l'Université, 67000, Strasbourg, France. Email: soraya.boudia@unistra.fr.

This introduction presents the results of our investigation on the interplay between transnational history and history of science studies.[1] We first consider how transnational history has emerged as a novel approach amongst the historical community at large. We then examine works in the history of science that present some of its key features. Drawing on these studies and our own analysis, we consider how transnational perspectives could promote a novel understanding of science as historical phenomenon. We thus highlight the methodological challenges associated with the adoption of a transnational approach, and envisage that one important advantage for those willing to explore transnational history would be propelling the interaction with historians outside our specialist domain.

Going transnational

Transnational history is a loosely defined term indicating the effort to produce novel historical accounts by focusing on the flows of people, goods, ideas or processes that stretched over borders. It has emerged following cross-contamination between disciplines and has been appropriated in different ways by different communities. In the *Dictionary of Transnational History*, French transnational historian Pierre-Yves Saunier identifies three main waves in the use of the term 'transnational'. The first, in the 1950s and 1960s, was confined to economic and business sciences (hence the term 'transnational corporation') and law (with the emergence of 'transnational law'). Its promoters aimed to use it to tackle actions or events transcending national borders. The second wave, in the 1970s, saw the appropriations of the term in the social sciences. Political scientists Robert Keohane and Joseph Nye used the term 'transnational' to challenge realist, 'state-centred' approaches in the field of international relations, and urged scholars to study transnational organizations, interactions and flows (of money, people, objects and ideas). The 1990s wave, identified by Saunier as the rise of transnationalism 'as the new condition of being in the global age', was connected to globalization and the need to analyse this phenomenon-in-the-making. In the last decade transnational has become a buzzword (the most commonly used term in the academic world of the United States in the late 1980s and early 1990s, according to Gustavo Cano) and has been more widely used in other academic fields, including anthropology, gender and cultural studies, geography, sociology and history.[2]

1 One reason why we have decided to look into these matters is our involvement in a new research programme aiming at reconstructing the history of the earth sciences, especially in Europe, after 1945. Funded by the European Research Council, The Earth under Surveillance – TEUS (241009) examines the emergence of earth and environmental sciences as a result of the development of new forms of transnational patronage related to Cold War diplomatic and military needs. We acknowledge and thank Peder Roberts, Leucha Veneer and two anonymous referees for their comments and suggestions.

2 Pierre Y. Saunier, 'Entry: transnational', in Akira Iriye and Pierre-Yves Saunier (eds.), *The Palgrave Dictionary of Transnational History*, New York: Palgrave, 2009, pp. 1047–1055. For previous uses see, for instance, Robert Keohane and Joseph Nye, *Transnational Relations and World Politics*, Cambridge, MA: Harvard University Press, 1973.

Transnational history has thus emerged at a key transition point in the recent past, typified by important changes in the international political landscape. The end of the Cold War and the rise of globalization in economic, cultural and military terms stimulated the search for novel explanatory frameworks. The resurgence of nationalism (having its most dramatic expression in the Balkans War) and the spread of religious fundamentalism as a new international force needed to be understood with new tools of inquiry. Facing this 'brave new world', several historians wished to explain its legacy, and introduce new methods enabling them to explore issues such as the emergence and consolidation of international organizations, the growing influence of corporate multinationals and the rising tide of environmentalism. At the same time, the development of the Internet, and electronic access to resources worldwide, created a new working space for the historian and significantly transformed the profession. Indeed, scholars began to use these tools to explore conceptually and geographically distant places, also considering the potential of adopting comparative perspectives or approaches transcending national borders.[3]

Transnational history has appealed especially to diplomatic historians unhappy with the constrictive views propounded in some national history narratives, thereby offering the broader and more challenging interpretations. In the United States, this dissatisfaction led to reappraising the notion of an American exceptionalism and helped to bring back into fashion the social history of transnational themes such as diasporas, migrations and slavery. The 1988 election of Japanese diplomatic historian Akira Iriye as new president of the American Historical Association was a kind of turning point, as it made more visible the effort to promote new research programmes aiming at the 'internationalization of history'.[4] The development of a 'transnational cultural history' enabled US historians to go beyond accounts reiterating their nation's unique nature. In the years that followed, historians Ian Tyrrell, David Thelen and Thomas Bender responded to Iriye's call by establishing an informal group and then promoting the Internationalizing American History research programme at New York University (launched in 1992). Tyrrell's definition of transnational history as concerning 'the movement of peoples, ideas, technologies and institutions across national boundaries' brought the transnational approach to the attention of more historians.[5] It also instigated a dialogue between scholars across the Atlantic which has produced important exchanges. The recent publication of the *Dictionary of Transnational History* – in which

3 On the implications of using these new means for archival work see, for instance, Bruce V. Lewenstein, 'The history of now: reflections on being a "contemporary archivist"', in Ron Doel and Thomas Söderqvist (eds.), *The Historiography of Contemporary Science, Technology and Medicine: Writing Recent Science*, London and New York: Routledge, 2006, pp. 31–42.

4 Akira Iriye, 'The internationalization of history', *American Historical Review* (1989) 94, pp. 1–10.

5 Ian Tyrrell, 'What is Transnational History?' Excerpt of a paper given at the Ecole des hautes études en sciences sociale (Paris) in January 2007. Available at http://iantyrrell.wordpress.com/what-is-transnational-history, last accessed 13 September 2010. See also Iriye, op. cit. (4). Instrumental to these developments were the special issues on transnational history in the *Journal of American History*, and conferences were held at La Pietra (Florence, Italy). David Thelen, 'The nation and beyond: transnational perspectives on United States history', *Journal of American History* (1999) 86, pp. 965–975. See also Thomas Bender (ed.), *Rethinking American History in a Global Age*, Berkeley: University of California Press, 2002.

half of the contributors are non-US nationals – highlights the importance of these interactions and the effort to blend different traditions together in the shaping of this approach.[6] New historical studies have indeed flourished, covering the movement of people (migrations, travel and tourism); the role played by organizations operating internationally (multinational corporations, non-governmental organizations, religious associations, criminal and terrorist groups); and the international management of infrastructures, resources and environmental issues.[7]

Yet transnational history has been only one of several perspectives that have thrived in the last twenty years. Other approaches such as world history and new global history share with transnational history the wish to abandon Euro- and US-centric viewpoints, explaining the role of historical actors and agencies in international networks, and focusing on the circulation of people, objects and ideas.[8] Transnational history approaches appear to differ from these perspectives because of their focus on the modern and contemporary periods, and the reappraisal of nations' role in shaping the past. Indeed, because of these distinctive chronological and theoretical features, some scholars have argued that transnational history pays more attention to nation states than do its alternatives.[9]

It is also notable that German and French historians have appraised their own national exceptionalisms (*Sonderweg*; *exception française*) by developing transnational approaches, especially through the use of comparative and transfer history (*Transfergeschichte*). By focusing on the idea of transnational transfer – of ideas, technologies and cultural practices – its advocates showed correlations invisible from a standpoint of national history. This new perspective has led them to reflect on the interconnectedness of historical accounts focusing on European countries.[10] The *histoire croisée* ('entangled history') movement, for instance, has promoted studies connecting social, cultural and political formations in different places and times.[11] Pierre Yves Saunier has emphasized the influence of these European developments in the rise of

6 Iriye and Saunier, op. cit. (2).

7 Palgrave's *Dictionary* offers an insight into this richness of themes and issues. See also Akira Iriye, 'Transnational history', *Contemporary European History* (2004) 13, pp. 211–222.

8 On world history see Raymond Grew, 'Expanding worlds of world history', *Journal of Modern History* (2006) 78, pp. 878–898. On the new global history see Bruno Mazlish, *The New Global History*, London: Routledge, 2006; Bruno Mazlish and Ralph Buultjens (eds.), *Conceptualizing Global History*, Boulder: Westview Press, 1993.

9 Christopher A. Bayly, Sven Beckert, Matthew Connelly, Isabel Hofmeyr, Wendy Kozol and Patricia Seed, 'AHR conversation: on transnational history', *American Historical Review* (2006) 111, pp. 1441–1464.

10 However, according to Kiran Patel, the emphasis on European connections has hindered the transformation of these approaches into fully fledged transnational perspectives. Kiran K. Patel, '"Transnations" among "transnations"? the debate on transnational history in the United States and Germany', *Center for European Studies Working Paper Series* (2008) 159, pp. 6–7.

11 On transfer and comparative history see Heinz-Gerhard Haupt and Jürgen Kocka, 'Comparative history: methods, aims, problems', in Deborah Cohen and Maura O'Connor (eds.), *Comparison and History*, London: Routledge, 2004, pp. 23–39. On *histoire croisée* see Michael Werner and Bénédicte Zimmermann, 'Penser l'historie croisée. Entre empirie et réflexivité', *Annales* (2003) 58, pp. 7–36; and Michael Werner and Bénédicte Zimmermann, 'Beyond comparison: histoire croisée and the challenge of reflexivity', *History and Theory* (2006) 45, pp. 30–50.

transnational history, and has recently brought American and European developments together by defining transnational history as embracing narratives of all kinds involving 'movements and forces that cut across national boundaries'. Transnational history, he argues, 'means goods, it means people, it means ideas, words, capital, might, and institutions'.[12]

As the debates on transnational history continue, the coming years will certainly offer new elements of analysis to its participants and clarify the issues at stake. Yet the absence of the historian of science from this discussion has been notable, and it has been only recently addressed in a few monographs, collective volumes and conferences.[13] This dearth is remarkable because in the past historians of science have almost taken for granted the role of science in a global dimension; science being a typical object of study beyond borders. Thus what seems to have been neglected is the effort to theorize and debate around the implication of transnational history rather than to practise the approach. In fact, both recent and classic studies by scholars in the field have cast new light on the transnational dimension of science, without, however, reflecting on its methodological implications. Why is that?

Disconnected histories: the transnational approach and the history of science

Far from being the result of negligence, the absence of historians of science from these discussions on transnational history may be explained as a consequence of the ways in which the discipline has changed while this approach has emerged. To clarify this point, a distinction has to be made between two different conceptions of what is 'transnational' in science. The first refers to the idea of epistemic universalism, which understands science as a transcendent, truth-finding activity that, in principle, should not be affected by national, class or ethnic differences. The second addresses social interactions that define science as cross-border, transnational activity.

The early configuration of the history of science as a history of scientific ideas took for granted the idea of epistemic universalism. Scientific activity, intended as a means to achieve the goal of establishing true representations of the natural world, was indeed considered intrinsically transnational. This attitude informed the work – and political

12 Pierre-Yves Saunier, 'Going transnational? News from down under', *Historical Social Research* (2006) 31, pp. 118–131. More recently, Saunier and Akira Iriye have argued that transnational history deals with 'links and flows' and the tracking of 'people, ideas, products, processes and patterns that operate over, across, through, beyond, above, under, or in-between polities and societies'. Iriye and Saunier, op. cit. (2), p. xxviii.

13 Such as the monograph Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900*, Basingstoke: Palgrave Macmillan, 2007; and the edited volumes Josep Simon and Néstor Herran (eds.), *Beyond Borders: Fresh Perspectives in History of Science*, Newcastle: Cambridge Scholars Publishing, 2008; Simon Schaffer, Lissa Roberts, Kapil Raj and James Delbourgo (eds.), *The Brokered World: Go-Betweens and Global Intelligence, 1770–1820*, Sagamore Beach: Science History Publishing, 2009. See also Simon Schaffer's recent participation in the Writing the History of the Global: Challenges for the 21st Century conference, Institute for Historical Research, May 2009 (www.history.ac.uk/events/conferences/729). The *Palgrave Dictionary of Transnational History* covers scientific issues in few entries (scientific expeditions and stations, scientific instruments, prizes, standards, mathematics and medicine). On the other hand, the history of technology is well represented.

positioning – of historians like George Sarton or Alexandre Koyré.[14] After the Great War, John D. Bernal and Joseph Needham advocated a new type of scientific internationalism based on socialist values, an ideal that can also be traced in their later contributions to the history of science.[15]

The development of a social history of science in the 1970s challenged these canonical views, calling into question the very notion of epistemic universalism and emphasizing the understanding of scientific research as inseparable from contingent social, economic and political activities.[16] This shift took place at the time of the 'thick description' turn in social science that propelled the production of micro-history and the study of science in local context. In these studies the role of local and national sponsors and patrons was emphasized, while the international dimension of scientific activities was only surmised. Analyses of the political and military implications of science usually enlisted the state as key sponsor, limiting the analysis within one nation's borders. The study of Big Science and the military–industrial complex as sociological and historical phenomena all referred to the state as patron and planner of modern science.[17] This effort to produce a sociologically inspired history of science has led to a more realistic description of its past and current legacy, but has, however, downplayed its international dimension. In this issue, Mark Walker shows the dominance of this trend in recent literature. His examination of articles that have appeared in the journal *Osiris* during the last twenty years shows that historians of science have focused on the international and transnational dimension but – at the same time – the nation still plays a central role in their narratives. That said, it is important to note that in recent years there have been more attempts to appraise the role of nation states as an interpretative category in the history of science and to address science as a transnational phenomenon.[18] In what follows we examine different ways in which historians of science have dealt with this transnational dimension and, along the way, we also introduce the issues raised by the contributors to this edited collection.

14 Sarton, for example, stated that *Isis* would 'denounce on every possible occasion the imperialist tendencies that some scientists try to impose on the science of their country or of their race', while Koyré's history of scientific ideas had as a guiding principle the will to show 'the unity of human thought, particularly in its highest forms'. On the idea of the universality of science see Geert J. Somsen, 'A history of universalism: conceptions of the internationality of science from the Enlightenment to the Cold War', *Minerva* (2008) 46, pp. 361–379.

15 Gary Werskey, 'The Marxist critique of capitalist science: a history in three movements?', *Science as Culture* (2007) 16, pp. 397–461. See also Robert M. Young, 'Marxism and the history of science', in Robert C. Olby *et al.* (eds.), *Companion to the History of Modern Science*, London: Routledge, 1990, pp. 77–86.

16 Steven Shapin, 'History of science and its sociological reconstructions', *History of Science* (1982) 20, pp. 157–211; *idem*, 'Discipline and bounding: the history and sociology of science as seen through the externalism–internalism debate', *History of Science* (1993) 30, pp. 333–369. See also Werskey, op. cit. (15).

17 Peter Galison and Bruce Hevly (eds.), *Big Science: The Growth of Large-Scale Laboratories*, Stanford: Stanford University Press, 1992; Stuart W. Leslie, *The Cold War and American Science: The Military–Industrial Complex at MIT and Stanford*, New York: Columbia University Press, 1992; Jeff Hughes, *The Manhattan Project: Big Science and the Atom Bomb*, London: Icon, 2003.

18 Elisabeth Crawford, Terry Shinn and Sverker Sörlin (eds.), *Denationalizing Science: The Contexts of International Scientific Practice*, Dordrecht: Kluwer Academic, 1993; Lewis Pyenson, 'An end to national science: the meaning and the extension of local knowledge', *History of science* (2002) 40, pp. 251–290. John Krige and Kai-Henrik Barth (eds.), *Global Power Knowledge*, *Osiris* (2006) 22.

A transnational approach that has been very successful in the past was embedded in the comparative history of science. Current literature enlists numerous examples of comparative analysis and has offered important historiographical insights. For example, Jack Morrell's notion of 'research schools' emerged in the comparison between the activities of the groups set up by Scottish chemist Thomas Thomson and his German colleague Justus von Liebig. Thomas P. Hughes's views about large technological systems drew on the comparative assessment of European and North American electrical supply networks. Joseph Needham's erudite survey of Chinese science and technology was inspired by comparing the divergent paths of Chinese and Western science in the early modern period.[19] More recently, comparative studies have helped to understand international events such as universal exhibitions and scientific congresses.[20] In history of technology, the Tensions of Europe and Inventing Europe projects are organized on the basis of cross-national comparisons, arguing that European integration moved along the transnational definition of technological infrastructures dating back to the mid-nineteenth century.[21] The research group STEP (Science and Technology in the European Periphery) has also provided an interesting platform for comparative studies focusing on scientific travels, textbooks, popularization and controversies in the European periphery.[22]

19 Jack B. Morrell, 'The chemist breeders: the research schools of Liebig and Thomas Thomson', *Ambix* (1972) 19, pp. 1–46; Gerald L. Geison and Frederick L. Holmes (eds.), *Research Schools: Historical Reappraisals*, *Osiris* (1993) 8; Thomas P. Hughes, *Networks of Power: Electrification in Western Society, 1880–1930*, Baltimore: Johns Hopkins University Press, 1983; Joseph Needham, *The Grand Titration: Science and Society in East and West*, Buffalo: University of Toronto Press, 1979. On the comparative method see also Margaret C. Jacob, 'Science studies after social construction: the turn toward the comparative and the global', in Victoria E. Bonnell and Lynn Hunt (eds.), *Beyond the Cultural Turn: New Directions in the Study of Society and Culture*, Berkeley: University of California Press, 1999, pp. 95–120; and G.E.R. Lloyd, 'The comparative history of pre-modern science: the pitfalls and the prizes', *Studies in History and Philosophy of Science* (1997) 28, pp. 363–368. For a recent survey on comparative history of science see Lewis Pyenson, 'Comparative history of science', *History of Science* (2002) 40, pp. 1–33, 4.

20 On universal exhibitions see, for example, Paul Greenhalgh, *Ephemeral Vistas: The Expositions Universelles, Great Expositions and World's Fairs, 1851–1939*, Manchester: University of Manchester Press, 1988; and Anne Rasmussen and Brigitte Schroeder-Gudehus, *Les fastes du progrès: Le guide des expositions universelles, 1851–1992*, Paris: Flammarion, 1992. Some good examples of historical research on international congresses are Anne Rasmussen, 'Jalons pour une histoire des congrès internationaux au XIXe siècle: régulation scientifique et propagande intellectuelle', *Relations internationales* (1990) 62, pp. 115–133; and Ronald E. Doel, Dieter Hoffmann and Nikolai Krementsov, 'National states and international science: a comparative history of international science: congresses in Hitler's Germany, Stalin's Russia, and Cold War United States', *Osiris* (2005) 20, pp. 49–76.

21 Thomas J. Misa and Johan Schot, 'Inventing Europe: technology and the hidden integration of Europe', *History and Technology* (2005) 21, pp. 1–20. Erik van der Vleuten and Arne Kaijser (eds.), *Networking Europe: Transnational Infrastructures and the Shaping of Europe, 1850–2000*, Sagamore Beach: Science History Publications, 2006; Johan Schot, 'Building Europe on transnational infrastructures: European infrastructures', *Journal of Transport History* (2007) 28, pp. 167–171. Transnational or 'global' perspectives are also in Daniel R. Headrick, *Technology: A World History*, Oxford: Oxford University Press, 2009; David Edgerton, *Shock of the Old: Technology and Global History since 1900*, London: Profile Books, 2006.

22 For an overview of the STEP program and its main results until 2008 see Kostas Gavroglu *et al.*, 'Science and technology in the European periphery: historiographical reflections', *History of Science* (2008) 46, pp. 153–175. Some noteworthy comparative studies arising from this group are, for example, Ana Simões, Ana Carneiro and Maria Paula Diogo (eds.), *Travels of Learning: A Geography of Science in Europe*, Dordrecht:

Some of these studies have openly endorsed the methodological principles of *histoire croisée*, thus revealing that specific developments in science can be inscribed into similar trends in nation building and in the imperialist ambitions of nations. Lewis Pyenson's article in this issue illustrates the merits of this approach by showing the existence of common patterns in national scientific expeditions. By looking at the production of knowledge in nineteenth-century military campaigns of territorial expansion in the North American plains, Patagonia and northern Central Asia, he thus reveals that the military 'embedded' scientist played a key role in very distant places.

Such an analysis has the obvious advantage of offering a comparative angle on problems that historians have previously examined as part of an analysis either of colonial/imperialist endeavours or of national scientific developments. Exploring common trends offers important benefits, such as showing that these endeavours were not exclusive to national programmes and highlighting that patterns in the patronage of science appear to transcend national borders.

Pyenson's admirable use of comparative history, however, evidences that we still need to know a great deal about the interplay between actors and organizations fostering the circulation of similar ideas and practices beyond borders. Thus, if comparative history helps us to see similarities between scientific practices and ideas in distant places, then diametrically opposed approaches – such as those set forward in colonial science studies – show the coexistence in the same geographical areas of different sets of knowledge which are redefined in the interaction between local communities. For instance, studies focusing on the transmission of knowledge in colonial and postcolonial settings have revealed how important this interaction has been locally and globally. Studies on the relations between colonizers and colonized (intelligence gathering, political control, economic dependence) have also highlighted the importance and consequences of appropriating and reappropriating specific sets of knowledge and thus negotiating their meanings and applications.[23] In the history of science, some pathbreaking studies of this kind have focused on agronomy and medicine's role in the administering of colonial relationships,[24] the uses of global means

Kluwer, 2002; and Faidra Papanelopoulou, Agustí Nieto-Galan and Enrique Perdiguero, *Popularizing Science and Technology in the European Periphery, 1800–2000*, Aldershot: Ashgate, 2009. The potential of transnational history has been realized by STEP and one of the authors is coordinator for a specific group on transnational approaches. See STEP webpage, http://147.156.155.104, last accessed 23 December 2010.

23 Kapil Raj, 'Colonial encounters and the forging of new knowledge and national identities, 1760–1850', *Osiris* (2000) 15, pp. 119–134; *idem*, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900*, New York: Palgrave Macmillan, 2010. See also Benedikt Stuchey, *Science across the European Empires 1800–1950*, London: OUP/German Historical Institute, 2005.

24 See, for instance, Christophe Bonneuil, 'Crafting and disciplining the tropics: plant science in the French colonies', in John Krige and Dominique Pestre (eds.), *Science in the Twentieth Century*, Amsterdam: Harwood, 1997, pp. 77–96; and Christophe Bonneuil, 'Development as experiment: science and state building in late colonial and postcolonial Africa, 1930–1970', *Osiris* (2000), 15, pp. 1501–1520; Paolo Palladino and Michael Worboys, 'Science and imperialism', *Isis* (1993) 84, pp. 84–102; Michael Worboys, 'Colonial medicine', in Roger Cooter and John Pickstone (eds.), *Medicine in the Twentieth Century*, Amsterdam: Harwood Academic Publishers, 2000, pp. 67–80. And more recently Deborah Neill, 'Paul Ehrlich's colonial connections: scientific networks and the response to the sleeping sickness epidemic, 1900–1914', *Social History of Medicine* (2009) 1, pp. 61–77.

of communication in the affirmation of imperial rule,[25] or scientific travelling and exploration in the modern and contemporary periods.[26]

If we thus shift the focus of attention from comparison to interplay, then there is an equally extensive literature in the history of science that has analysed the importance of bodies and agencies acting as regulators in the international flows of scientists, scientific instruments and materials. Historical studies covering these movements have looked into large-scale scientific migrations – from forced exile in the 1930s to the more recent 'brain drain' phenomenon – addressing not only the factors fostering these movements but also the regulations and limitations existing at national level.[27] As a key element in defining these flows, and in the transformation of science as global enterprise, the existence of transnational forms of patronage has also been analysed, especially by looking into the role of agencies such as the Rockefeller, Ford and Carnegie foundations.[28] These organizations have played a key role in reconfiguring scientific careers and institutions and tying locally sourced research into broader networks. The study of internationally recognized scientific awards entails an analysis of similar issues.[29]

The international distribution of scientific commodities such as materials, instruments and information – in the form of specialized publications – has also been investigated as a transnational phenomenon.[30] Gabrielle Hecht and Angela Creager's works on the

25 Such as the recent Aitor Anduaga, *Wireless and Empire: Geopolitics, Radio Industry and Ionosphere in the British Empire, 1918–1939*, Oxford: Oxford University Press, 2009. See also Dwayne R. Winseck and Robert M. Pike, *Communication and Empire: Media, Markets, and Globalization, 1860–1930*, Durham, NC: Duke University Press, 2007.

26 On the role of travel in the making of scientific knowledge see Marie-Nöelle Bourguet, Christian Licoppe and Otto Sibum (eds.), *Instruments, Travel and Science: Itineraries of Precision from the 17th to the 20th Century*, London: Routledge, 2002; James Delbourgo and Nicholas Dew (eds.), *Science and Empire in the Atlantic World*, New York: Routledge, 2008. See also the literature in historical geography on episodes of scientific exploration in the recent past. For instance, Simon K. Naylor and James R. Ryan, *New Spaces of Exploration: Geographies of Discovery in the Twentieth Century*, London: I.B. Tauris, 2009.

27 On forced exile see Paul Hoch, 'The reception of central European refugee physicists of the 1930s: USSR, UK, USA', *Annals of Science* (1983) 40, pp. 217–246; and Diane Dosso, 'Louis Rapkine (1904–1948) et la mobilisation scientifique de la France libre', PhD dissertation, Université Paris VII/Denis Diderot, 1998. On science migrations and brain drain see Vladimir Jankovic, 'Science migrations: mesoscale weather prediction from Belgrade to Washington, 1970–2000', *Social Studies of Science* (2004) 34, pp. 45–75; and Matthew Godwin, Jane Gregory and Brian Balmer, 'The anatomy of the Brain Drain debate, 1950–1970s: witness seminar', *Contemporary British History* (2009) 1, pp. 35–60. On the enforcement of borders and limitations see Simone Turchetti, *The Pontecorvo Affair: A Cold War Defection and Nuclear Physics*, Chicago: University of Chicago Press, 2011, Chapter 3; and Néstor Herran, 'Spreading nucleonics: the Isotope School at the Atomic Energy Research Establishment, 1951–1967', *BJHS* (2006) 39, pp. 569–586.

28 Jean-François Picard, *La Fondation Rockefeller et la recherche médicale*, Paris: PUF, 1999; Giovana Gemelli, Jean-François Picard and William H. Schneider, *Managing Medical Research in Europe: The Role of the Rockefeller Foundation 1920s–1950*, Bologna: Clueb, 1999; Ilana Löwy, *Virus, moustiques et modernité: science, politique et la fièvre jaune au Brésil*, Paris: Éditions des archives comtemporaines, 2001; Ilana Löwy and Patrick Zylberman (eds.), 'The Rockefeller Foundation and the biomedical sciences', *Studies in History and Philosophy of Biology and Biomedical Sciences* (2000) 31(C), p. 3.

29 Robert M. Friedman, *The Politics of Excellence: Behind the Nobel Prize in Science*, New York: Freeman and Times Books, 2001.

30 See Josep Simon, 'Communicating physics in nineteenth-century France and England: the production, distribution and use of Ganot's textbooks', PhD dissertation, University of Leeds, 2009; Nicolaas Rupke, 'Translation studies in the history of science: the example of "Vestiges"', *BJHS* (2000) 33, pp. 209–222.

trading of radioactive materials and radioisotopes have highlighted how streams of goods, knowledge and practices are controlled at the transnational scale.[31] The analysis of the ways techno-scientific activities are regulated (in the production of drugs or toxicants, for instance) also provides a good example of how transnational history finds application in the field.[32] This area of research has indeed close links with environmental and public-health histories, as the methods used to trace scientific objects and to regulate their use can be applied, for instance, to the study of industrial pollution. The historical study of scientists involved in the provision of new international regulatory systems has developed significantly in recent years, also examining their dealings with industrialists, diplomats and policy-makers.[33] Christopher Sellers and Joseph Melling's article in this issue shows that historians cannot really explain industrial hazard regulation unless they refer to the transactions between those actors negotiating the meaning of 'hazardous' at the international level. Historians, they demonstrate, have the important responsibility of shedding new light on these negotiations. This is especially because the setting up of 'industrial hazard regimes' relies upon the manufacturers' efforts to externalize costs by making hazardous products acceptable (scientifically and legally) to those countries that present fewer restrictive regulations about their uses. Exploring the transnational circulation of knowledge thus becomes a key feature in the analysis of how hazardous trades have been reinterpreted, negotiated and relocated in undeveloped and less-developed countries.

This analysis reveals that scientists play a key role, together with politicians and diplomats, in the administration of international affairs. This is partly because their research is set in the context of geopolitical ambitions which are congenial to the sponsorship of specific scientific programmes.[34] Scientists' expertise can be used by governments in the administration of specific tasks in global governance or even in intelligence affairs.[35]

31 Angela Creager, 'Tracing the politics of changing postwar research practices: the export of "American" radioisotopes to European biologists', *Studies in History and Philosophy of the Biological and Biomedical Sciences* (2002) 33, pp. 367–388; Gabrielle Hecht, 'Africa and the nuclear world: labor, occupational health, and the transnational production of uranium', *Comparative Studies in Society and History* (2009) 51, pp. 896–926; Néstor Herran and Xavier Roqué, 'Tracers of contemporary technoscience', *Dynamis* (2009) 29, pp. 123–130.

32 Patrick Zylberman, 'Making food safety an issue: internationalised food politics and French public health from the 1870s to the present', *Medical History* (2004) 48, pp. 1–28; Ilana Löwy and Jean-Paul Gaudillière, 'Localizing the global: tests and the clinical management of hereditary risks of breast cancer in a comparative perspective (France, USA, UK)', *Science, Technology and Human Values* (2008) 33, pp. 299–325; Soraya Boudia, 'Global regulation: controlling and accepting radioactivity risks', *History and Technology* (2007) 23, pp. 389–406.

33 On birth control see Matthew Connelly, *Fatal Misconception: The Struggle to Control World Population*, Cambridge, MA: Harvard University Press, 2008. On environmental health hazards see Soraya Boudia and Nathalie Jas, 'Risk and "risk society"', *History and Technology* (2007) 23, pp. 317–331; Boudia, op. cit. (32).

34 See, for example, Fae Korsmo, 'The genesis of the International Geophysical Year', *Physics Today* (2007) 60, pp. 38–43; or Simon Naylor, Katrina Dean, Martin Siegert and Simone Turchetti, 'Science, geopolitics and the governance of Antarctica', *Nature Geoscience* (2008) 1, pp. 143–145.

35 As part of what Ronald E. Doel has defined as a history of a science 'in black'. See Ronald E. Doel, 'Scientists as policymakers, advisors, and intelligence agents: linking contemporary diplomatic history with the

The degree of autonomy conferred on scientists as international actors is something that historians have debated while looking at the setting up of international scientific organizations. Elisabeth Crawford, Terry Shinn and Sverker Sörlin have described the modes of operation of these agencies as either spontaneous or bureaucratic, a typology that bears some resemblance to Aant Elzinga's distinction between autolethic (scientist-led) and eterolethic (government-led).[36] The first typology includes the International Association of Academies (1899–1913) or the International Council of Scientific Unions (ICSU, established 1931).[37] It also comprises organizations under the UNESCO umbrella – such as the International Union of Geodesy and Geophysics (IUGG), the International Union of Pure and Applied Physics (IUPAP) or the International Union of Biological Science (IUBS).[38] By contrast, organizations such as the Intergovernmental Panel on Climate Change (IPCC, established 1988) result from governments' action at international level.

Transnational narratives thus help us to reconsider the role of international scientific organizations and their activities at the intersection between science and diplomacy. A prominent example of this is John Krige's analysis of United States–Western European scientific relations. His book *American Hegemony* and his studies on NATO, CERN and EURATOM have revealed the inner mechanisms of policy-making defining transnational flows of scientific knowledge.[39] Krige has shown that controlling the circulation of knowledge was crucial to the US administration's plans to exercise greater influence on European affairs during the post-Second World War years. Such an analysis highlights that a transnational approach sheds new light on the role of international scientific cooperation in the shaping of US leadership and globalization in the twentieth century and beyond. In this issue Krige analyses the specific case of the development of gas

history of contemporary science', in Thomas Söderqvist (ed.), *The Historiography of Contemporary Science and Technology*, Amsterdam: Harwood Academic Publishers, 1997, pp. 215–244. See also *idem*, 'Does scientific intelligence matter?', *Centaurus* (2010) 52, pp. 311–322. On the role of scientific expertise see Clark A. Miller and Paul N. Edwards, *Changing the Atmosphere: Expert Knowledge and Environmental Governance*, Cambridge, MA: MIT Press, 2001; Gabrielle Hecht, 'Negotiating global nuclearities: apartheid, decolonization, and the Cold War in the making of the IAEA', *Osiris* (2006) 22, pp. 25–48; Kai-Henrik Barth, 'Catalysts of change: scientists as transnational arms control advocates in the 1980s', *Osiris* (2006) 22, pp. 182–208.

36 Elisabeth Crawford, *Nationalism and Internationalism in Science, 1880–1939: Four Studies of the Nobel Population*, Cambridge: Cambridge University Press, 1992. Aant Elzinga, 'Science and technology: internationalisation', in Neil J. Smelser and P.B. Baltes (eds.), *International Encyclopedia of the Social and Behavioral Sciences*, London: Elsevier, 2004, pp. 13633–13638. See also Aant Elzinga and Catharina Landström (eds.), *Internationalism and Science*, London: Taylor Graham, 1996.

37 Peter Alter, 'The Royal Society and the International Association of Academies, 1879–1919', *Notes and Records of the Royal Society of London* (1980) 34, pp. 241–264; Frank Greenaway, *Science International: A History of the International Council of Scientific Unions*, Cambridge: Cambridge University Press, 1996.

38 Jake Lamar, *Sixty Years of Science at UNESCO 1945–2005*, Paris: UNESCO, 2006.

39 John Krige, *American Hegemony and the Postwar Reconstruction of Science in Europe*, Cambridge, MA: MIT Press, 2008; John Krige and Arturo Russo, *A History of the European Space Agency*, 2 vols., Noordwijk: ESA, 2000; John Krige, 'The peaceful atom as political weapon: Euratom as an instrument of U.S. foreign policy in the 1950s', *Historical Studies in the Natural Sciences* (2008) 38, pp. 5–44; John Krige *et al.*, *History of CERN*, 3 vols., Amsterdam: North Holland, 1987–1996; John Krige and Kai-Henrik Barth, 'Introduction: science, technology, and international affairs', *Osiris* (2006) 22, pp. 1–24.

centrifuges and he frames this account in the context of Cold War nuclear cooperation between Britain and the United States. Using the notion of 'hybrid knowledge', he dissects the transnational melange that typifies this collaboration and reveals the ways in which its protagonists wished to appropriate its components as national endeavours.

Krige's examination, especially if coupled with what Melling and Sellers tell us about international dealings on hazard legislation, is enlightening and disquieting at the same time. We come to learn that knowledge is an integral part of international power building and the meanings of sets of specific knowledge are constantly renegotiated by the actors who 'hybridize' them in an effort to bring these negotiations to success at their end. The lesson we learn is disenchanting too, especially if compared with what epistemic universalism preached. Science can no longer be depicted as a universal force for truth in the face of conflicting and divisive powers in the realm of politics. Transnational historical accounts show that universalism in science offers no reassurance of enduring validity as meanings reflect specific interests. It is not just that no universal knowledge can escape the hybridization process, but also that those skilled in the art of hybridizing can exercise greater influence in international affairs. 'Impurity' blurs the boundaries between the epistemology and the politics of knowledge.

If we take all the aforementioned studies together, we begin to grasp the prominence that transnational narratives have had in the field. They all manifest an interest in producing historical analyses encompassing the integrated study of different forms of global circulation of scientific knowledge and products, including the construction and functioning of international institutional and professional spaces devoted to science. This takes us back to the problem mentioned at the beginning of this section: historians of science have not neglected to use transnational or global approaches; they have just been peripheral to current debates on its historiographical implications.

In the next section we suggest enriching this variety of transnational approaches. In particular, our proposal may help us to understand the transnational dimension of science by focusing on hybrid domains (scientific and geopolitical at the same time) in which flexible identities (the scientist–diplomat–politician) operate. In what follows we define these domains as 'transnational scientific networks' and use this notion to explain how transnational perspectives could expand our understanding of the mechanisms of knowledge production and the role of science in global affairs.

Writing the transnational history of science

In recent years historians of science have focused on the production of scientific knowledge in its social milieu, shedding new light on such key determinants as (amongst others) the transmission of new paradigms through the training of new generations,[40] the coordination of belief in 'trading zones',[41] the functioning of

40 Thomas S. Kuhn, *The Structure of Scientific Revolutions*, Chicago: University of Chicago Press, 1962; Gerald L. Geison, 'Scientific change, emerging specialties, and research schools', *History of Science* (1981) 19, pp. 20–40; Andrew Warwick, *Masters of Theory*, Chicago: University of Chicago Press, 2003.

41 Peter Galison, *Image and Logic: A Material Culture of Microphysics*, Chicago: University of Chicago Press, 1997.

laboratories[42] and the circulation of knowledge.[43] This effort directed historians to new sources: instruments, notebooks, personal and institutional archives, popularization works, the press. It also challenged narratives built around the celebration of scientific discoveries by presenting the production of knowledge as a complex and dynamic process in which the meanings of new scientific theories are negotiated by a number of different actors. The analysis of transnational scientific networks should in principle extend this revision by explaining how locally produced knowledge becomes globally accepted. The establishment of these networks confers the authority needed to strengthen locally sourced scientific ideas and propel them beyond borders – by means of either patronage, or wider circulation, or adherence to international standards.

The emphasis on the role played by transnational scientific networks as facilitators, gatekeepers and stakeholders in the selection of locally produced knowledge sheds new light on the political and material circumstances that make it possible for these networks to thrive. An inspection of these dealings should pay attention to scientific coordination between nations and the provision of logistical support, commodities needed to carry scientific research (raw materials, instruments and products), scientific exchanges and migrations, the definition of international standards and the standardization of instruments. In many ways these negotiations forming the backbone of the production of new scientific knowledge already exist at local or national levels. However, the fact that science is construed as a universal and international phenomenon should make the study of transnational scientific networks even more compelling than the examination of its national and local equivalents.

One tension should be addressed in the definition of transnational scientific networks in order to avoid a somewhat naive understanding of their circumstances that leaves the power–knowledge nexus unaccounted for. The production of scientific knowledge should be understood as the result of a struggle between alternative networks competing for durability. Prominent transnational networks thrive because rival ones weaken – or succumb – because of the activities of their competitors. The existence of different strategies – like the diversification or discontinuation of support, the downsizing of existing international organizations and the gathering of intelligence as powerful tools to win over competing systems – should thus be better investigated. Thus transnational perspectives should lead to consideration of the asymmetry of political and symbolic power embedded in alternative scientific propositions and the contrast between hegemonic or dominant views and subaltern ones.[44] The scientific debate should thus be framed in this asymmetry as well as in the context of this struggle between alternative systems.

42 Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts*, Beverly Hills: Sage, 1979.

43 James Secord, 'Knowledge in transit', *Isis* (2004) 95, pp. 654–672.

44 On the construction of these views in colonial and postcolonial settings see the literature we have referred to in the footnotes above.

In a sense we are calling for greater attention to the transnational factors that, in the words of Naomi Oreskes, 'forge stable [scientific] consensus' or create 'epistemological affinities' between specific scientific groups operating internationally. Her research has shown how decisive this was in the construction of plate tectonics as a scientific theory describing the motion of the Earth's crust. The new theory resulted from a growing emphasis on international collaboration which was stimulated by US patronage of science at the height of the Cold War. Jacob Hamblin has also shown how competing views about crust motion from Soviet scientists succumbed (their community becoming increasingly isolated) while plate tectonics was being elaborated.[45] By no means have we thought that scientific consensus can be reached exclusively because of ways in which international scientific cooperation works. But we consider it an important component.

We thus suggest explaining how organizations that reach beyond borders are established, thrive, rival each other and are replaced. For instance, in the 1960s the promotion of international research in seismology through a number of United States-led research projects meant reducing the influence of other networks, which included Soviet experts.[46] Hamblin has shown that in the same period the creation (through the NATO Science Committee) of a United States-led network to support oceanographic research undermined similar research carried out under the auspices of the International Council for the Exploration of the Sea (ICES).[47] Shardul Agrawala has argued that, more recently, the IPCC establishment responded to the US urgency of seizing down the influence of the UN Environmental Programme on climate and environmental matters.[48]

Of course, it is easier to frame an opposition between competing transnational scientific networks in the Cold War context given the highly divisive political circumstances in which international scientific work was carried out at the time. However, the study of colonial science shows that the early nineteenth century was equally divisive in terms of production, access and fruition of scientific knowledge. For instance, Kapil Raj has called attention to how British-sponsored scientific missions in India aimed to gather information on local knowledge so as to embed it in British science while, at the same time, reducing the influence that local experts had in the region. Thus, while strengthening a new transnational scientific network based on Britain's empire, they weakened an alternative one based on more traditional ties in the region.[49] Aitor Anduaga has revealed that during the interwar period Britain's relations with the

45 Naomi Oreskes, 'Science and public policy: what's proof got to do with it?', *Environmental Science and Policy* (2004) 7, pp. 369–383. Jacob D. Hamblin, *Oceanographers and the Cold War: Disciples of Marine Science*, Seattle: University of Washington Press, 2005; Amy Dahan and Hélène Guillemot, 'Climate change: scientific dynamics, expertise, and geopolitical stakes', in G. Mallard and C. Paradeise (eds.), *Global Science and National Sovereignty: Studies in Historical Sociology of Science*, New York: Routledge, 2008, pp. 195–219.

46 Simone Turchetti, '"In God we trust; all others we monitor": seismology in international and intelligence Affairs', forthcoming.

47 Hamblin, op. cit. (45), pp. 233–235.

48 Shardul Agrawala, 'Context and early origins of the Intergovernmental Panel on Climate Change', *Climatic Change* (1998) 39, pp. 605–620.

49 Raj, 'Colonial encounters', op. cit. (23), pp. 119 (on intelligence gathering) and 129–133 (on uses of local knowledge for imperial purposes).

Commonwealth countries were decisive in shaping the study of the ionosphere. While promoting the role of British research centres for the production of new knowledge in the field, British administrators wished to reduce the impact of similar studies coming from Australian centres in the light of their relevance to the setting up of telecommunication networks.[50]

Revealing the circumstances of these networks is beneficial in terms of shedding new light on not just the emergence of scientific knowledge in its transnational context, but also the specific geopolitical factors that accompany the establishment of these networks. This should explain the role of science in the administration of global affairs. This is an aspect that should undoubtedly appeal to those historians of science who seek to extend the reach of their discipline, especially in terms of emphasizing science's relevance in the shaping of new policies. As Gary Werskey has recently noted, voicing a preoccupation shared by many in the profession, the richness in detail achieved in recent work in the history of science has too frequently been achieved at the cost of excluding a political analysis or commentary.[51]

However, transnational narratives should not thrust aside the role of the state in the construction of transnational scientific networks, but rather reveal inner motives and vested agenda in their promotion from within specific national groups. Current literature places much emphasis on the role of the state and its key actors in setting up the conditions of the development of science nationally, but their effort to advertise science globally has yet to be extensively explored.

This may depend on the ways in which scientists themselves have framed their role in international activities. The image of a scientific community that reaches out beyond borders has been very influential in the past, also resonating with the scientists' experience as international actors. It has been a powerful rhetorical tool for promoting their independence from governmental decisions. For example, one of the few historical studies openly adopting the term 'transnational' is Matthew Evangelista's work on American and Soviet scientists who sought to bring about arms control in the 1980s through a collaborative effort outside the constraining political boundaries set by the Cold War.[52]

However, the case stands out as an exception to the growing amount of historical evidence showing transnational science reflecting, rather than conflicting with, national interests. For example, Ronald Doel has shown that during the Cold War the pursuit of international scientific collaboration, even across the Iron Curtain, was often instigated and sanctioned at government level in recognition that national interests were better protected in the shaping of political and scientific alliances with other countries. Doel tells us that leading US science administrators understood that advancement in the geophysical sciences could be propelled by promoting international collaboration in data gathering and exchange. This collaboration was an integral part of US strategic and

50 Anduaga, op. cit. (25), pp. 184–190.

51 Werskey, op. cit. (15), p. 441.

52 Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War*, Ithaca: Cornell University Press, 1999.

military planning, even when in its execution it entailed exclusively the gathering of basic (non-military, open) scientific data.[53]

Doel's research has coupled with Krige's works highlighting that international scientific collaboration matched the US wish to promote shared values and coordinate defence measures with allied countries.[54] Recent work on the origins of the Antarctic Treaty has shown that the creation of a transnational research network in Antarctic science was consistent with US foreign-policy needs while facing the threat of Russian occupation of new territories in the South Pole.[55]

To sum up, although it would be reassuring to see the creation of transnational scientific networks exclusively as the result of scientists' research interests (or political motivations), recent work provides a more nuanced interpretation pointing at the ways in which vested national interests are sublimated through their propositions. If this is the case, then their study should reveal how international scientific relations have played a key role in foreign affairs. We now know that in the recent past these relations have gained growing importance in their administration. The establishment of bureaus devoted to scientific affairs in embassies and ministries is telling of this growth. Far from being disinterested, scientific internationalism coalesced on specific strategies of action which integrated national perspectives and revealed geopolitical ambitions. For this reason, their study tells a great deal more than we now know about the role of science in global affairs.

Bringing together our examination of the implications of introducing transnational perspectives in the study of the mechanisms of knowledge production and international scientific relations, we conclude that the ideological and geopolitical competition between rivalling transnational scientific networks unites the search for novel ways to build and harness knowledge of the world and establish new power relationships between its promoters.

Conclusion

There is an opportunity to open new spaces of collaboration which could propel the discipline beyond its current reach. We thus believe that debating transnational history of science can be a first step towards realizing this opportunity. Could transnational approaches enrich history-of-science narratives? What might be gained and lost from adopting these new perspectives?

First of all, this issue does not invite us to fall into blissful enthusiasm for a new approach and to adopt it without debate. The implications of introducing a new perspective have, of course, to be fully appreciated by the scholars themselves.

53 Ronald E. Doel and Allan E. Needell, 'Science, scientists and the CIA: balancing international ideals, national needs and professional opportunities', *Intelligence and National Security* (1997) 12, pp. 59–81. See also Doel, 'Scientists as policymakers, advisors, and intelligence agents', op. cit. (35).

54 Krige, *American Hegemony and the Postwar Reconstruction of Science*, op. cit. (39).

55 Aant Elzinga, 'Antarctica: the construction of a continent by and for science', in Elisabeth Crawford *et al.* (eds.), *Denationalizing Science: The Context of International Scientific Practice*, Dordrecht: Kluwer Academic, 1993, pp. 73–106. Simone Turchetti, Simon Naylor, Katrina Dean and Martin Siegert, 'On thick ice: scientific internationalism and Antarctic affairs, 1957–1980', *History and Technology* (2008) 24, pp. 351–376.

Globalization, for example, appears to be an inescapable referent in transnational narratives as it provides an all-encompassing interpretative category underlying global change. At the same time, however, some practitioners found this conceptualization problematic. Could transnational history end up reifying transnational organizations in the same way as national histories have legitimized nation states? Will the emphasis placed on global historical events work against recent developments in social history emphasizing the need for the historian to zero in on specific social cohorts in their space and time? Is transnational history far too demanding in terms of resources needed to take it to completion?

Sven Beckert has pointed out that transnational history should be understood as a 'way of seeing', not as a specific set of instruments for historical work.[56] However, understanding what tools are needed to conduct research in transnational history is an important issue. Federico Romero has recently analysed the methodological requirements of transnational history (teamwork, accessibility to archives in many countries, linguistic skills), suggesting that these needs make it a luxurious and elitist approach. He thus concludes that its more sustained adoption could separate historians into two groups: those few working at endowed academic institutions devoted to transnational research, and the less-privileged majority, whose research would be devoted to national or local histories by necessity.[57]

It might be, as Romero argues, that such an effort is hindered by the availability of financial resources. But it is likely that putting together a more comprehensive set of sources capable of explaining the global dimension of science entails new forms of international collaboration rather than affluence. And the availability of new ways to establish connections and collaborations through the Internet makes the prospect of producing new transnational accounts even more 'low-cost'. Thus the quest for producing transnational narratives might in the future propel greater collaboration between historians who work in different countries, in order to put together their expertise in the examination of different local/national contexts and come up with truly integrated narratives bringing together alternative and conflicting viewpoints. Saunier recommends conducting 'research in different languages, to become familiar with several archival systems and historiographical traditions and questions, to learn how to imagine the sources which can help to answer his questions'. Saunier also invites us to avoid being 'complacent with limits and habits inherited from the historian's linguistic domain and/or from training'. These suggestions, in our opinion, point in the right direction.[58]

Transnational history is raising more interest amongst historians of science: case studies are flourishing, and also challenging inherited disciplinary borders and institutional settings. We see this new perspective as an opportunity to complement

56 Bayly *et al.*, op. cit. (9), p. 1454.

57 Federico Romero, 'La globalizzazione e la storia delle relazioni internazionali', 2003, quoted by Saunier, op. cit. (2), pp. 129–130. See also F. Romero, 'Globalizzazione e frammentazione nella storia delle relazioni internazionali', paper presented at the La storia contemporanea in Italia oggi: linee di tendenza e orientamenti di ricerca workshop , Lecce, 25–27 September 2003, available at www.sissco.it/fileadmin/user_upload/Attivita/Convegni/cantieriII/globalizzazione/romero.rtf, last accessed 19 March 2012.

58 Saunier, op. cit. (2), p. 126.

other – equally important – interpretative frameworks. There is thus an opportunity to open new spaces of collaboration which could propel the discipline beyond its current reach. We thus believe that debating transnational history of science can be a first step towards realizing this opportunity.

Our aim here was not to give a catalogue of solutions to what a transnational history of science should be. In the concluding remarks Dominique Pestre warns us that transnational narratives offer important gains to historians of science interested in exploring the science–power nexus and yet we should resist the temptation of advocating a specific methodology (or – as he calls it – 'metaphysics'), thus benefitting from the richness and variety of approaches that typify the history of science. To sum up, there is no single way to transnational history.

However, we insist on the importance for historians of science to take part in debates concerning transnational history. Historians of science have much to offer to transnational debates given their analysis of conceptual cross-overs and hybridization processes. Their sensitivity in dealing with analytical categories is an important asset in this regard. It is up to the reader to judge if this special issue keeps the promise of promoting a better understanding of the place of transnational analyses in our field. Indeed, we would like to argue that scholars in the field further the self-reflexive effort to consider the place and prominence of transnational analyses, especially in light of current changes in the institutional structures of human and social sciences and the internationalization of our research community.