

Toward a Transnational History of Technology

Meanings, Promises, Pitfalls

ERIK van der VLEUTEN

The past two decades have seen a boom in historical publications claiming to offer a transnational history or a transnational perspective on history. Some even speak of a “transnational turn” in historiography, and history journals regularly feature discussions on the pros and cons of this concept. Transnational perspectives have also begun to inform state-of-the-art history of technology research. Tom Misa and Johan Schot recently argued that such perspectives may help historians of technology engage with such “inherently transnational processes” as globalization, regional integration, climate change, and industrialization.¹

The opportunity for historians of technology to engage with transnational history seems twofold. First, in historiography concepts are judged by their ability to inspire new research, and transnational history may suggest to historians of technology new and important research questions and strategies. Second, a transnationally minded technological history may in turn inform transnational historical scholarship, which tends to recognize the pivotal importance of technology but often lacks the concepts and experience to study it adequately.

In this essay, I will take this double opportunity as a starting point to examine more closely the possibility of a transnational history of technology. I shall try to sort out some of its potentially conflicting meanings and

Erik van der Vleuten is universitair docent in the School of Innovation Sciences at Eindhoven University of Technology, the Netherlands. He recently coedited, with Arne Kaijser, *Networking Europe: Transnational Infrastructures and the Shaping of Europe, 1850–2000* (2006). He thanks Gerard Alberts, Francesca Bray, Karen Freeze, Eda Kranakis, Thomas Misa, Pierre Mounier-Kuhn, Pierre-Yves Saunier, and Johan Schot for helpful comments on earlier drafts of this essay, and the Netherlands Organization for Scientific Research (NWO) and the European Science Foundation (ESF) for financial support.

©2008 by the Society for the History of Technology. All rights reserved.
0040-165X/08/4904-0007/974–94

1. Thomas Misa and Johan Schot, “Inventing Europe: Technology and the Hidden Integration of Europe,” *History and Technology* 21 (2005): 1–20, at 2.

implications: what could “a transnational history of technology” possibly mean, why is it interesting or important, and what are the pitfalls of this line of inquiry? In short, what should historians of technology know when responding to the challenges of transnational history?

Before proceeding, let me briefly note some of the ways that historians of science and technology have begun to address the promises I refer to above. They have, for instance, studied the role of transnational networks of scientists working for nuclear arms control; transnational versus national influences on professional engineering identities; transnational patenting and the associated transnationalization of industrial property rights; knowledge acquisition of firms beyond national systems of innovation; and the role of technology in globalization (understood as “a large number of phenomena sharing a transnational or world-encompassing character”).² In particular, the study of transnational networks of scientists has been embraced by transnational historians in search of agents forging global community.³

But without question the major experiment in transnational history of technology to date is the pan-European research network and program Tensions of Europe: Technology and the Making of Europe, a “transnational enterprise” exploring and defining “ways to study transnational European history with a focus on the role of technology.”⁴ As a transnational history of technology incubator, Tensions of Europe not only experiments with novel forms of collective research (currently associating some two hundred researchers around a common research agenda and themes) and collective funding (particularly noteworthy is its latest offshoot, the ambitious European Science Foundation program Inventing Europe).⁵ It also demonstrates how a transnational history research agenda inspires innovative history of technology research.

This research agenda initially emerged from internal history of tech-

2. Kai-Henrik Barth, “Catalysts of Change: Scientists as Transnational Arms Control Advocates in the 1980s,” in *Global Power Knowledge: Science and Technology in International Affairs*, ed. John Krige and Kai-Henrik Barth (Chicago, 2006), 182–208; Gary Lee Downey and Juan C. Lucena, “Knowledge and Professional Identity in Engineering: Code-Switching and the Metrics of Progress,” *History and Technology* 20 (2004): 393–420; Eda Kranakis, “Patents and Power: European Patent-System Integration in the Context of Globalization,” *Technology and Culture* 48 (2007): 689–728; Arjan van Rooij et al., “National Innovation Systems and International Knowledge Flows,” *Technology Analysis and Strategic Management* 20, no. 2 (2008): 149–68; and Peter Lyth and Helmut Trischler, eds., *Prometheus Wired: Globalisation, History and Technology* (Aarhus, 2004). For the history of science, see also Josep Simon and Néstor Herran, eds., *Beyond Borders: Fresh Perspectives in History of Science* (Newcastle, 2008).

3. Compare Akira Iriye, “Transnational History,” *Contemporary European History* 13: 211–22.

4. See <http://www.tensionsofeurope.eu> (accessed 28 March 2008).

5. See <http://www.esf.org/inventingeurope> (accessed 28 March 2008). Another related program is the Netherlands Organization for Scientific Research (NWO) program Transnational Infrastructures and the Rise of Contemporary Europe; see <http://www.tie-project.nl> (accessed 28 March 2008).

nology considerations, but its resonance with transnational history concerns was soon acknowledged. When Johan Schot, Ruth Oldenziel, and others in 1999 set out to study contemporary European history through the lens of technology, they found that existing overviews either juxtaposed or compared national histories of technology or adopted a general “Western technology” perspective represented by a few leading countries. These scholars argued that major technical developments happened not only in national contexts but also in subnational and international ones. More important, nation-centered histories missed the “European dimension”—that is, the connected histories of Europe’s nations, cities, and microregions, its international collaborations, and its global context, including transatlantic and colonial and postcolonial relations. To study “Europe as something more than a collection of partly contrasting and partly overlapping national experiences”⁶ the program suggested investigation of “international linkages between infrastructures, exchanges, and circulation (and control) of people, artifacts, capital, knowledge, goods, services and natural resources” as research sites where “Europe” and “technology” were mutually constituted.⁷ The prominence of the word “tensions” signaled the contested character of such processes.

This agenda has inspired an impressive range of scholarship. Examples include studies of transnational infrastructures, from heavily contested cross-border railway or telegraph links to pan-European rail, road, and electric power networks;⁸ research on large transnational projects, from Concorde and Airbus to CERN, EURATOM, and space programs;⁹ work on

6. Johan Schot, Ruth Oldenziel, et al., “Tensions of Europe: Technology and the Making of Twentieth Century Europe: Proposal for a European Science Foundation Network” (2000), 3 (part of the initial proposal to the ESF; copy in author’s possession). See also Johan Schot and Ruth Oldenziel, “Tensions of Europe, Phase 2: Intellectual Agenda,” available at <http://www.tensionsofeurope.eu> (accessed 28 March 2008).

7. This suggestion was first articulated in Johan Schot, “Tensions of Europe: Twentieth Century European History of Technology: Description of an International Project” (1999), 2. (This is a reworked version of the keynote presented at the workshop “Tensions of Europe: Technology, Economy, and Society in the Twentieth Century,” Eindhoven University, 25–26 November 1999). Compare Misa and Schot (n. 1 above), 9–11.

8. Erik van der Vleuten and Arne Kaijser, “Networking Europe,” *History and Technology* 21 (2005): 21–48; Van der Vleuten and Kaijser, eds., *Networking Europe: Transnational Infrastructures and the Shaping of Europe, 1850–2000* (Sagamore Beach, Mass., 2006); Johan Schot, ed., “Building Europe on Transnational Infrastructures,” special issue of the *Journal of Transport History* 28 (2007); Vincent Lagendijk, *Electrifying Europe: The Power of Europe in the Construction of Electricity Networks* (Amsterdam, 2008); Frank Schipper, *Driving Europe: Building Europe on Roads in the Twentieth Century* (Amsterdam, 2008); Irene Anastasiadou, *In Search of a Railway Europe: Transnational Railway Developments in Interwar Europe* (Amsterdam, forthcoming); Alexander Badenoch and Andreas Fickers, eds., *Europe Materializing? Transnational Infrastructures and the Project of Europe* (forthcoming).

9. Helmut Trischler and Hans Weinberger, “Engineering Europe: Big Technologies and Military Systems in the Making of Twentieth-Century Europe,” *History and Technol-*

transnational mediation or consumption junctions, from multinationals to organizations such as Consumers International, which shaped twentieth-century European ways of life;¹⁰ and studies of the international circulation and local appropriation of technologies in the contexts of colonial and postcolonial relations, as well as in the shaping of modern cities.¹¹

Even in the Tensions of Europe program, however, the term “transnational” has been given divergent (and sometimes conflicting) meanings, and explicit reflection on the connotations and pitfalls of transnational history perspectives is lacking. Especially if we are to contemplate a transnational history of technology that transcends the confines of that program, such reflection seems indispensable. In the remainder of this essay, I shall draw on two decades of debate on the pros and cons of transnational history to propose some guidelines for a transnational history of technology.

What Does Transnational History Mean?

A first indication of possible new perspectives and research questions associated with transnational history may be found in various definitions of this concept. Not that those definitions are explicit and unambiguous; from the beginning, when the term “transnationalism” first became popular among political scientists in the 1960s and early 1970s, its precise meaning was considered unclear and problematic. As Samuel Huntington put it in 1973, “many people . . . use it to mean many different things. It has achieved popularity at the price of precision.”¹² The same is true in historiography; since its take-off in the 1990s, “transnational history” has been characterized as a fluid, broad term packed with contradictory impulses, a catch-all concept lacking precision.¹³ When contemplating a transnational

ogy 21 (2005): 49–84; Nina Wormbs, “A Nordic Satellite Project Understood as a Trans-National Effort,” *History and Technology* 22 (2006): 257–75.

10. Ruth Oldenziel, Adri Albert de la Bruhèze, and Onno de Wit, “Europe’s Mediation Junction: Technology and Consumer Society in the Twentieth Century,” *History and Technology* 21 (2005): 107–40; Ruth Oldenziel and Karin Zachmann, eds., *Kitchen Politics: Americanization, Technology Transfer, and European Users* (Cambridge, Mass., in press).

11. David Arnold, “Europe, Technology, and Colonialism in the 20th Century,” *History and Technology* 21 (2005): 85–106; Gabrielle Hecht, ed., *Bodies, Networks, Geographies: Colonialism, Development, and Cold War Technopolitics*, in manuscript; Mikael Hård and Thomas Misa, eds., *Urban Machinery: Inside Modern European Cities* (Cambridge, Mass., 2008).

12. Samuel Huntington, “Transnational Organizations in World Politics,” *World Politics* 25 (1973): 333–68, at 334.

13. See David Thelen, “The Nation and Beyond: Transnational Perspectives on United States History,” *Journal of American History* 86 (1999): 965–75, at 968, and Patricia Clavin, “Introduction: Defining Transnationalism,” *Contemporary European History* 14 (2005): 421–40, at 433–34.

history of technology, it is therefore important to acknowledge the different and potentially conflicting meanings and connotations of the term; these may suggest different research questions, but at the price of confusion and misunderstanding. To sort this out at least a bit, I shall here discuss three such meanings found in the transnational history literature. Although these might coincide and overlap in the writings of individual authors, they have sufficiently distinct roots and connotations to merit separate treatment.

First, transnational history often refers to the study of cross-border flows. This follows from the dictionary definition of “transnational” as transcending national boundaries. It is invariably cited in recent discussions of transnational history, in particular when specifying the object of inquiry. Authoritative examples include Akira Iriye writing of “the study of movements and forces that cut across national borders,” and Pierre-Yves Saunier referring to a transnational angle that “cares for movements and forces that cut across national boundaries. It means goods, it means people, it means ideas, words, capital, might, and institutions.”¹⁴ These two historians coedit the forthcoming Palgrave dictionary of transnational history, which investigates the “circulation and flows of people, ideas and objects across national boundaries, with the structures that support these flows and with different scales across which structures and flows operate.”¹⁵ Several historians of technology contribute to this notable project. A final example is the introduction to transnational history by Ann Curthoys and Marilyn Lake, highlighting “ways in which past lives and events have been shaped by processes and relationships that have transcended the borders of nation states . . . transnational history seeks to understand ideas, things, people and practices which have crossed national boundaries.”¹⁶ As a consequence, they argue, transnational history practitioners often use concepts like “fluidity,” “circulation,” “flow,” “connection,” and “relationship.”

While this meaning of transnational history seems straightforward and in line with the examples from technological history noted above, two comments are in order. First, Saunier’s recent etymology of the term “transnational” demonstrates that actual usage deviates from its dictionary meaning. There is a clear cross-border element in the first known use of the word, by the German philologist Georg Curtius in 1862 in reference to “transnational language families.” (It appeared in American English within

14. Iriye, “Transnational History” (n. 3 above), 213; Pierre-Yves Saunier, “Going Transnational? News from Down Under,” *History: Transnational*, <http://geschichte-transnational.clio-online.net/>, 13 January 2006 (accessed 13 August 2007).

15. “Guidelines for Contributors,” *Palgrave Dictionary of Transnational History*, www.palgrave.com/history/transnational (accessed 13 August 2007). See also Pierre-Yves Saunier, “Learning by Doing: Notes about the Making of the Palgrave Dictionary of Transnational History,” *Journal of Modern European History* 6, no. 2 (2008, in press).

16. Ann Curthoys and Marilyn Lake, introduction to *Connected Worlds: History in Transnational Perspective* (Canberra, 2005), 5–20, at 5.

the same decade.) But in the United States “transnational” was also used synonymously with “transcontinental,” most notably in highway building. Here the term meant traversing, not transcending, the nation.¹⁷

More important, the designation “cross-border studies” may be too narrow to capture much ongoing work in transnational history and, by extension, an emerging transnational history of technology. An instructive example from technological history is Judith Schueler’s recent examination of the multiple cultural meanings of the famous Gotthard railway tunnel.¹⁸ Certainly this tunnel, inaugurated in 1882, was and is a key node in transalpine traffic and therefore one of Europe’s most prominent north-south passages. Still, Schueler’s analysis of the cultural meanings of this tunnel and the Gotthard Massif is not well characterized as an instance of cross-border studies: her research aims and conclusions concern not cross-border flows but the layered meanings of this railway project within Switzerland, and in particular its inscription in Swiss national identity. Accordingly, Schueler’s research method and sources—on-site examination of cultural meanings and representations using local, regional, and national publications, memorials, exhibitions, and museums—were primarily within a single nation’s borders (the Gotthard Massif is located within Switzerland, not at its border). Her analysis of the cultural nationalization of an international transport node clearly fits a transnational history research agenda, but this is an agenda that embraces more than cross-border flows (see the discussion of the third sense of “transnational,” below). In general, the cross-border connotation of transnational history may suit scholars working on globalization or regional integration better than those re-examining national or local history from transnational perspectives.

Second, “transnational” is frequently employed to refer to the study of the historical role of international nongovernmental organizations (and the relations and flows that they represent) in shaping the modern world. This meaning derives from the so-called first transnational turn in the social sciences, around 1970.¹⁹ It originated in political science, where “transnational” became a term of rebellion challenging the so-called state-centric view of world affairs in the subdiscipline of international relations.²⁰ In this state-centric view (as in its historiographical cousin, diplomatic history) the focus was on interactions among formal representatives

ESSAYS

17. Akira Iriye and Pierre-Yves Saunier, eds., *Palgrave Dictionary for Transnational History*, s.v. “Transnational/Transnationalism” (London: Palgrave Macmillan, forthcoming).

18. Judith Schueler, “Travelling towards the ‘Mountain that has Borne a State’: The Swiss Gotthard Railways,” in *Networking Europe* (n. 8 above), 71–97, and *Materialising Identity: The Co-Construction of the Gotthard Railway and Swiss National Identity* (Amsterdam, 2008).

19. *Palgrave Dictionary for Transnational History*, s.v. “Transnational/Transnationalism.”

20. Joseph S. Nye and Robert O. Keohane, “Transnational Relations and World Politics: An Introduction,” *International Organization* 25 (1971): 329–49.

of state governments—politicians, diplomats, and soldiers—to the exclusion of a booming number of nongovernment actors who also made a deep imprint on world affairs. State-centric international relations was therefore to be supplemented by the study of “transnational relations,” defined as “contacts, coalitions, and interactions across state boundaries that are not controlled by the central foreign policy organs of governments.”²¹ Transnational relations as a focus of study was further subdivided into “transnational interactions”—denoting in a particularly obdurate definition that at least one participant is not a government agent or an intergovernmental organization—and “transnational organizations,” referring to nongovernmental organizations such as IBM, Unilever, international trade unions, or the Roman Catholic Church.

This understanding of transnational—as opposed to the formal “international” or “interstate” system—still has currency in political science today, as in, for example, debates on transnational activism pivoted against realism.²² It also thrives in transnational historical scholarship. Indeed, historians interested in activists and civil society shaping the twentieth-century world may define transnational history in opposition to “international history” and emphasize the popularity of the transnational turn among social and cultural, rather than political, historians.²³ In science and technology history, this concern resonates in studies of transnational networks of scientists and technologists, such as the Pugwash Conferences on Science and World Affairs.²⁴

While this usage of transnational history to connote a specific set of nongovernmental actors remains current, others have expanded its meaning to take in the role of all organizations involved in world affairs, whether nongovernmental or intergovernmental. This is also a carryover from political science debates; Huntington, for example, has criticized the first transnational turn for a one-sided focus on nongovernmental actors. He emphasizes the similarities, rather than the differences, between intergovernmental organizations such as the World Bank, governmental organizations such as the Central Intelligence Agency or the U.S. Air Force, and private organizations such as the Roman Catholic Church and General Motors: all were

21. *Ibid.*, 331.

22. Sidney Tarrow, *The New Transnational Activism* (Cambridge, 2005), and “Transnational Politics: Contention and Institutions in International Politics,” *Annual Review of Political Science* 4 (2001): 1–20; Thomas Risse-Kappen, “Ideas Do Not Float Freely: Transnational Coalitions, Domestic Structures, and the End of the Cold War,” *International Organization* 48 (1994): 185–214. This meaning informs the current Wikipedia entry on “Transnationalism” as well; see <http://en.wikipedia.org/wiki/Transnationalism> (accessed 13 August 2007).

23. Micol Seigel, “Beyond Compare: Comparative Method after the Transnational Turn,” *Radical History Review* 91 (2005): 62–90, at 63.

24. Barth (n. 2 above); Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Ithaca, N.Y., 1999).

bureaucratic organizations operating in many countries, and this defined their important role in world affairs.²⁵ Huntington therefore reserved the term “transnational” for transnational operations, that is, “significant centrally-directed operations in the territory of two or more nation-states” regardless of the private or public constitution of actors. Actors were no longer “international” or “transnational”; the World Bank, for instance, was international (intergovernmental) in control structure, multinational in personnel policy, and transnational in its operations.

This additional political science–inspired meaning also resonates in transnational history debates today. Iriye’s study of the role of international organizations in the making of the contemporary world juxtaposes nongovernmental and intergovernmental organizations as transnational forces building global community, providing a counterweight to twentieth-century nationalism and geopolitics, and possibly preventing a third world war.²⁶ Other historians have used Huntington’s insight that some organizations are simultaneously international, multinational, and transnational in re-evaluating the historical role of the League of Nations.²⁷ In the history of technology, a comparable understanding informs the notion of “transnational system builders,” an adaptation of Thomas Hughes’s original concept to explore the role of organizations—whether governmental, intergovernmental, or nongovernmental—in transnational infrastructure development.²⁸

These political science–inspired senses of the term “transnational history” are again somewhat constraining. Understanding transnational as nongovernmental tends to exclude those organizations and cross-border exchanges predominantly organized or controlled by formal state representatives, which is especially unfortunate in technological history, for both state and nonstate actors were key players in technical change. A technological history surely would study railway traffic regulation by the (nongovernmental) International Railway Union next to, not opposed to, telecommunications regulation by the (intergovernmental) International Telecommunications Union. The notion of international organizations (whether governmental or not) as characterized by transnational operations solves this problem, but it remains a subset of the former “cross-border studies” meaning. Furthermore, these political science–informed meanings of “transnational history”

25. Huntington (n. 12 above), 336. For a response, see Robert O. Keohane and Joseph S. Nye, “Transgovernmental Relationships and International Organizations,” *World Politics* 27 (1974): 39–62.

26. Akira Iriye, *Global Community: The Role of International Organizations in the Making of the Contemporary World* (Berkeley, Calif., 2002).

27. Clavin (n. 13 above); Patricia Clavin and Jens-Wilhelm Wessels, “Transnationalism and the League of Nations: Understanding the Work of Its Economic and Financial Organization,” *Contemporary European History* 14 (2005): 465–92.

28. Erik van der Vleuten et al., “Europe’s System Builders: The Contested Integration of Transnational Road, Electricity, and Rail Infrastructures,” *Contemporary European History* 16 (2007): 321–47.

place much weight on the term's specificity, whether that is opposed to the interstate system or to "international," "supranational," or "multinational" features of organizations. Separating these meanings counts as an intellectual gain, and to a political science audience blurring or confusing them may count as uninformed and imprecise. A transnational history of technology needs to be aware of that.

OCTOBER
2008
VOL. 49

Third, and finally, transnational history is often taken to mean decentering the nation-state from its position as the principal organizing category for scholarly inquiry. This resonates with what we may call the second transnational turn in the social sciences and the humanities, in the 1990s, and again it has a subversive undertone: in the context of increasing academic awareness and debate about the phenomenon of globalization, nation-centered analysis (at least initially) seemed less and less convincing. Transnational analysis supposedly provided an alternative.

In historiography, the blunt version of the argument was that the modern history profession was born in conjunction with the process of nation building and often tended to emphasize a monolithic national community by constructing national narratives, experiences, traditions, and values. It was therefore biased toward stressing the uniqueness of the nation—a tendency known as exceptionalism.²⁹ Transnational history questions such nation-centered history and spotlights other scales of lived history. As Thomas Bender has recently put the issue, "the nationalist histories of the nineteenth century naturalized the nation as the most significant form of human solidarity. Can history unmake what it did so much to make?"³⁰

This meaning was forcefully promoted by Ian Tyrrell and others beginning in the early 1990s, when these scholars proclaimed a "New Transnational History" in the United States. For Tyrrell, exceptionalism seemed particularly resilient in U.S. historiography, and it deserved rigorous scrutiny "from the perspective of alternative transnational approaches."³¹ Note that, contrary to the two meanings of transnational history discussed thus far, the research object remained U.S. national history, which was now to be studied from perspectives previously ignored. As in the former two meanings of transnational history, these perspectives could be international (for example, the influence of international trade, migration, and reform movements on U.S. national history). But in Tyrrell's understanding they

29. Curthoys and Lake (n. 16 above), 5.

30. Thomas Bender, "The Boundaries and Constituencies of History," *American Literary History* 18 (2006): 267–82, on 271.

31. Ian Tyrrell, "American Exceptionalism in an Age of International History," *American Historical Review* 96 (1991): 1031–55, on 1038. See also Michael McGerr, "The Price of the 'New Transnational History,'" *American Historical Review* 96 (1991): 1056–67, and Ian Tyrrell, "Ian Tyrrell Responds," *American Historical Review* 96 (1991): 1068–72. Similar arguments played out later in David Thelen (n. 13 above), 965–75, and Thomas Bender, "Historians, the Nation, and the Plentitude of Narratives," introduction to *Rethinking American History in a Global Age* (Berkeley, 2002), 1–21.

could also be subnational: studies of microregions (subnational or cross-border) could explicitly be recovered as part of a transnational history inquiry. The “national” as the organizing theme in U.S. history could thus be questioned from above and below, or, in David Thelen’s intriguing formulation, from movements “above, below, through, and around, as well as within, the nation state.”³² The new focus was on people, institutions, ideas, or culture moving through time and space in rhythms of their own, in which case they still “drew from, ignored, constructed, transformed and defied claims of the nation state.”³³

Historians in Europe similarly moved to decenter the nation-state. Their inspiration was a rising critique of the paradigm of comparative history, which was considered equally nation-centered and exceptionalist. Comparative history (the argument went) reduced variations in space and time to national experiences, which were subsequently compared, thus reifying national histories. In reaction, these historians developed a succession of increasingly encompassing and reflective waves of transnational history. Initially, “transfer history” showed the permeability of national borders by focusing on cross-border transfers of, for example, ideas and technologies. Later, “connected,” “relational,” or “embedded history” would debunk national exceptionalism by highlighting the related character of Europe’s national histories. Lastly, *histoire croisée* (crossing history) explicitly addresses the crossing of analytical boundaries (including the local-regional-national-international distinction) and urges researchers to reflect on their use of such terms as “national.”³⁴

Early critics, and probably a fair number of historians today, feared that decentering the nation-state would lead to abandoning the national as a category of analysis altogether.³⁵ This would indeed be a major difficulty, in view of the important role of the nation-state in modern history. Yet advocates of the new transnational history did not advocate giving up that analytical category, but rather placing it in its proper historical context. In Tyrrell’s words, “no one doubts the importance of both nationalism and the

32. Thelen, 967.

33. *Ibid.*

34. For an overview, see Hartmut Kaelble, “Die Debatte über Vergleich und Transfer und was jetzt?” *History Transnational*, <http://geschichte-transnational.clio-online.net>, 8 February 2005 (accessed 13 August 2007). The concept of transfer history is usually attributed to the work of Michel Espagne. For a more recent example in English, see Henk te Velde, “Political Transfer: An Introduction,” *European Review of History* 12 (2005): 205–21, on 206. For connected or relational history, see Sanjay Subrahmanyam, “Connected Histories: Notes toward a Reconfiguration of Early Modern Eurasia,” *Modern Asia Studies* 31 (1997): 735–62, and Philip Ther, “Beyond the Nation: The Relational Basis of a Comparative History of Germany and Europe,” *Central European History* 36 (2003): 45–73. For *histoire croisée*, see Michael Werner and Bénédicte Zimmermann, “Beyond Comparison: Histoire Croisée and the Challenge of Reflexivity,” *History and Theory* 45 (2006): 30–50.

35. McGerr.

nation-state in the modern world.”³⁶ What he proposed was to study U.S. national history in a three-tiered scheme of social action involving interactions of the international, national, and local spheres. “I do not mean to suggest that American history must be homogenized as part of some amorphous international history. The alternatives to national history that I propose would contextualize nationalism.”³⁷

OCTOBER
2008
VOL. 49

Later calls for a transnational history have repeated the observation that the nation-state remains a key analytical category that should be contextualized, not abandoned. Thus, unlike the first two meanings of transnational history discussed above, this third does not complement national analysis so much as embrace it. Nevertheless, for a number of scholars transnational history still connotes an underestimation of the importance of the nation-state. A transnational history of technology should therefore be explicit about its view of the nation-state in history.

* * *

Hans-Ulrich Wehler has noted that meanings of transnational history may proliferate even further when considering bodies of historical scholarship that address issues currently labeled, or relabeled, transnational, such as travel history, imperialism history, labor history, the history of religion, the history of industrialization, world history, and regional or mesoregional history.³⁸ However, I would be inclined to interpret these topic-centered literatures as forms of transnational history exactly because they speak to the more general, cross-topic research questions identified by the three meanings discussed above—about cross-border flows, about international organizations shaping the modern world, and about lived history across or within established analytical categories (and the importance of such categories as “the national” in history).

Where does all this leave the possibility of a transnational history of technology? First, I would suggest that we treat the interpretative flexibility of the idea of transnational history as an enrichment, not a disqualification. The dictum that the only good concepts are unambivalent ones seems outdated; good concepts usually involve successful trade-offs between many criteria—familiarity, resonance, parsimony, coherence, differentiation (from other concepts), depth, and others.³⁹ Historiographical concepts specifically

36. Tyrrell, “American Exceptionalism” (n. 31 above), 1033.

37. Ibid., 1038, and Tyrrell, “Ian Tyrrell Responds” (n. 31 above).

38. Hans-Ulrich Wehler, “Transnationale Geschichte—der neue Königsweg historischer Forschung?” in *Transnationale Geschichte: Themen, Tendenzen und Theorien*, ed. Gunilla Budde, Sebastian Conrad, and Oliver Janz (Göttingen, 2006), 161–73.

39. The social sciences would add theoretical utility and field utility. John Gerring, “What Makes a Concept Good? A Critical Framework for Understanding Concept Formation in the Social Sciences,” *Polity* 31 (1999): 357–93.

should also inspire new research, and all three connotations of transnational history have already proved productive for technological history.

Indeed, perhaps the transnational history of technology experiment *Tensions of Europe* resonates so well because its research agenda tacitly mobilizes all three connotations of transnational history. The theme of cross-border studies is, for instance, foregrounded in research of transnational infrastructures and cross-border flows. The role of international organizations, especially nongovernmental organizations, in shaping the modern world informs the key research concern of investigating how engineering and business communities built “Europe” in the technological sphere, producing a “hidden integration” (and fragmentation) overlooked in histories of European integration that focus on the politicians who built the European Union and its predecessors.⁴⁰ This focus has inspired scholarly work on transnational organizations such as international road, railway, and tourist associations regulating international ground transportation at a time when the transport policies of the European Communities had not yet been born or failed to take off.⁴¹ The third meaning, finally, surfaces in the explicit ambition to investigate and evaluate the roles of pan-European, transatlantic, and colonial and postcolonial relations in shaping contemporary Europe, as well as the influence of the nation-state and the city in that process. It emerges also in the twin concepts of “circulation” and “appropriation,” complementing the study of cross-border flows (circulation) with research into national and local modes of resistance and appropriation as those play out in the histories of, for example, American consumption models, IBM business strategies, international urban planning ideologies and technologies, or transnational traffic junctions (like the Gotthard railways mentioned above).⁴² In other words, this form of transnational technological history includes the reassertion of the national and local in twentieth-century history.

While drawing on these varied meanings of transnational history as sources of new questions, a transnational history of technology should certainly be aware of the different ring the term has to different audiences, and of the misunderstandings this can induce. In particular, a transnational history of technology needs to be quite explicit about whether or not to include such research categories as intergovernmental organizations (as opposed to nongovernmental ones), the local, and the nation-state.

40. Misa and Schot (n. 1 above).

41. Johan Schot, “Introduction: Building Europe on Infrastructures,” *Journal of Transport History*, 3rd ser., 28, no. 2 (2007): 167–71.

42. Oldenziel and Zachmann (n. 10 above); Hård and Misa (n. 11 above). See also ongoing research described in Johan Schot et al., eds., *Eurocores Programme Inventing Europe: Technology and the Making of Europe, 1850 to the Present* (Strasbourg, 2007), available at <http://www.esf.org/inventingeurope> (accessed 28 March 2008).

What Does Transnational History Promise?

OCTOBER
2008
VOL. 49

This discussion of the meanings of transnational history provides a first approximation of possible research questions and perspectives that could inform a transnational history of technology. But where will these new research questions lead? What, in short, are the grand promises of transnational history? Some of the concerns behind transnational history seem rather mundane.⁴³ These include the internationalization of the history profession; historians increasingly travel abroad, publish in international journals, and so on, and this trend coincides with an increased focus on “connections” and embedding research in a common scholarly discourse. Tellingly, transnational history in Australia, for some, answered “a desire to break out of historiographical marginality and isolation.”⁴⁴ It is in the realm of content, however, that the potential of transnational history becomes exciting. In particular, it promises two core benefits.

The first is to spotlight and investigate important topics previously neglected, or underestimated, or inadequately conceptualized. The ground was prepared, perhaps, by the growth of social and cultural history in the 1980s and 1990s, because their topics—social groupings, ideological categories, personal memories—were much less entangled with the nation-state as a central category than traditional military and diplomatic history.⁴⁵ Some topics, such as the histories of diasporas and nomads, led scholars to “query the tyranny of the national in the discipline of history.”⁴⁶

Most authors agree, however, that the breakthrough for transnational history occurred when globalization and regional integration (such as the European Union) became more important themes in public affairs, along with such global issues as environmentalism, human rights, and terrorism. These phenomena transcended existing units of analysis; they required a new form of historiography.⁴⁷ For Saunier, for instance, “one of the most immediate possibilities opened by the adoption of a transnational angle is a contribution to the historization of what is commonly called ‘globalization.’”⁴⁸ Similarly, Iriye notes that words like “global” and “globalization” proliferated in the 1990s and calls for “a historical context for the phenomenon of globalization.”⁴⁹ A recent exchange on transnational history in the

43. This point was made by Iriye, “Transnational History” (n. 3 above), 212–13.

44. Curthoys and Lake (n. 16 above), 15.

45. Iriye, “Transnational History,” 212.

46. Donna R. Gabbacia, “Is Everywhere Nowhere? Nomads, Nations, and the Immigrant Paradigm of United States History,” *Journal of American History* 86 (1999): 1115–34, quote on 1116.

47. Iriye, “Transnational History,” 211; Kaelble (n. 34 above); Budde, Conrad, and Janz (n. 38 above), 11. Seigel (n. 23 above) disagrees and argues that anticolonialism and postcolonialism triggered the transnational turn.

48. Saunier, “Going Transnational?” (n. 14 above).

49. Iriye, *Global Community* (n. 26 above), 196.

American Historical Review predominantly addresses globalization and its interpretations.⁵⁰

A transnational history of technology obviously will contribute to this endeavor. This seems particularly appropriate because historians of globalization have frequently invoked technology as an exogenous driving force, often dividing the history of globalization into epochs defined by the expansions of sixteenth- and seventeenth-century shipping networks, nineteenth-century rail and telegraph networks, twentieth-century air travel and broadcasting technologies, or today's internet. A transnational history of technology should provide a more nuanced picture of the role of technology in globalization, drawing on the perspectives discussed in the preceding section.⁵¹

The transnational history of technology explored in *Tensions of Europe* holds out similar prospects for the study of European regional integration. Thomas Misa and Johan Schot argue that the history of technology could help explore the "meaning and significance of European integration" as a transnational process, seeing European integration as something more than an episode in the international relations of nation-states. The particular contribution of technological history to such a new transnational history of European integration would be its inquiry into a "hidden integration" and "hidden fragmentation" in the realm of technological linking and delinking, circulation and appropriation, which are largely missed in existing histories of European integration. The explorative first phase of *Tensions of Europe*, Misa and Schot argue, demonstrated the viability of this transnational approach. If the research agendas developed here are followed up, "a new kind of history of European integration will emerge as well as a new kind of history of technology."⁵²

The second core benefit of a transnational perspective on history is that it furnishes a new and more accurate perspective on existing themes in historical scholarship, a novel understanding of not only global or regional integration issues but also national and local history. This was the promise held out by the New Transnational History of the early 1990s: a more balanced view of U.S. history, which took into account international, national, and subnational developments. In European history (as distinct from more recent European integration history or the European Union), the second wave of transnational history ("connected" or "embedded" history) conveyed the similar message that "the history of Europe and its single states,

50. C. A. Bayly et al., "AHR Conversation: On Transnational History," *American Historical Review* 111 (2006): 1441–64.

51. See, for example, Lyth and Trischler (n. 2 above). In technological history, such work has a history predating the transnational turn, most notably by Daniel Headrick; see *The Tools of Empire* (Oxford, 1981), *The Tentacles of Progress* (Oxford, 1988), and *The Invisible Weapon* (Oxford, 1991).

52. Misa and Schot (n. 1 above), 15.

OCTOBER
2008
VOL. 49

regions and cities, and its peoples should not be written as artificially national, but as transnational histories."⁵³ A transnational angle on urban history, likewise, would take into account the myriad of international exchanges, associations, and congresses—aptly called the Urban Internationale—defining perceptions of urban issues in order to better understand what happened locally.⁵⁴ The promise of a more qualified understanding of existing historiographical themes is also found beyond the confines of local and national history—in, for example, histories examining the role of the transnational disarmament movement in the cold war, which for Matthew Evangelista was a matter of “setting the historical record straight.”⁵⁵

Again, historians of technology may contribute to such a re-evaluation of existing themes. A recent collection of essays on the transnational urban history of technology, edited by Mikael Hård and Thomas Misa, is a case in point. These scholars have added to transnational urban history work a focus on technological issues, spotlighting the confrontation of such homogenizing forces as international associations developing urban planning ideals and technologies on the one hand, and the local appropriation processes in which urban officials, engineers, planners, and citizens could adapt new urban technologies to their local interests and traditions on the other.⁵⁶

One may ask how far the concept of transnational history can be extended backward in time, to eras predating nation-state dominance. For some, the sense of “transcending the national” makes the notion of transnational history seem too restrictive before about 1850, when “large parts of the globe were not dominated by nations so much as by empires, city states, diasporas, etc.”⁵⁷ They might prefer the phrase “global history” to a transnational history. Others argue that transnational history provides innovative analytical perspectives even for earlier periods. Immigration history, as Patricia Seed notes, has tended to focus on either the origins or the destination of the migrant. Adopting a transnational history perspective, however, requires such histories to focus on both simultaneously, exploring the multiple ties between the lands of origins and destination.⁵⁸ One might likewise expect a transnational history of technology to be productive in premodern history as well.

53. Ther (n. 34 above), 69.

54. Pierre-Yves Saunier, “Sketches from the Urban Internationale,” *International Journal of Urban and Regional Research* 25 (2001): 380–403. Thomas Bender has noted that Frederick Jackson Turner, in his 1891 article “The Significance of the Frontier in American History,” held that “local history can only be understood in the light of the history of the world”; see “Historians, the Nation, and the Plentitude of Narratives” (n. 31 above), 4.

55. Evangelista (n. 24 above), 5.

56. Mikael Hård and Thomas Misa, “Modernizing European Cities: Technological Uniformity and Cultural Distinction,” in Hård and Misa (n. 11 above), 1–22.

57. Bayly et al. (n. 50 above), 1442.

58. *Ibid.*, 1443.

Pitfalls

ESSAYS

A transnational perspective on history, in sum, may train attention onto important subjects previously relegated to the margins and produce more perceptive work on existing themes. Moreover, transnational history offers research sites and questions to facilitate such inquiry, spotlighting cross-border flows, international organizations shaping the modern world, and lived history across or within established analytical categories. A transnational history of technology may profit from, and contribute to, such lines of research. But with opportunity comes risk, and the transnational history literature discusses some of the potential dangers in this approach to historical scholarship.

A brief digression into comparative history debates may help interpret the status of historiographical pitfalls. Transnational history manifestos generally criticize comparative history for reifying national exceptionalism. But as Jürgen Kocka has observed in response to this criticism, good comparative history does not necessarily construct national essentialism and exceptionalism.⁵⁹ It may well bring out elements of national particularity, but it is also indispensable for challenging these conceptions—as when testing claims to primacy or particularity. For analytical purposes comparative history indeed does cut entanglements when constructing its units of comparison, but good comparative work also reconstructs embeddedness and context, and it critically reflects on and accounts for its chosen categories of comparison. For Kocka, while comparative and transnational history are fundamentally different, both can be carried out in more or less reflective ways, and both have their place in historiography. Indeed, Kocka advocates combining them to bring out connections as well as difference. The point is that the risks entailed by any historiographical perspective, even those inherent in its basic intellectual operations, do not necessarily disqualify it. Rather, they help distinguish good practice from not-quite-so-good practice. What are those dangers, then, that separate good transnational history from more problematic versions?

Two have already been discussed: misunderstandings introduced by the multiple meanings that may be assigned to the concept of transnational history, and underestimating the importance of the nation-state in modern and contemporary history.⁶⁰ Guarding against the first demands reflection about the presumed audience and explication of which analytical categories (e.g. intergovernmental organizations, the nation-state) are included and which are not; the second requires that the role of the nation-state vis-à-vis other categories—such as cold war tensions, regional integration, transatlantic relations, and so on—be explicitly thematized.

59. Jürgen Kocka, “Comparison and Beyond,” *History and Theory* 42 (2003): 39–44.

60. For example, Alan Milward, *The European Rescue of the Nation-State*, 2nd ed. (London, 2000).

OCTOBER
2008
VOL. 49

A third hazard is that studying more distant transnational phenomena may risk alienation of local and national audiences and, by extension, a loss of relevance to local and national political debates. This is so not only because audiences and politicians seem “intensely nationalistic.”⁶¹ A professional reorientation toward international peers instead of lay audiences at home, too, may imply that historians only study local and national history when relevant to international historiographical debates; “as a result, there is the danger that the people whose history we write will know little of our work; and even if they do, they recognize that we are not really talking to them. Our gaze has moved elsewhere.”⁶²

One response offered to this warning has been that historians’ audiences have not only national identities but also parochial and international ones.⁶³ More important, as noted above, a transnational history agenda may well aim at improving national and urban history, in which case the problem seems to fade. It is also instructive to recall how the transnational turn worked out in other disciplines. In anthropology, for example, transnationalism may refer to transmigration sparked by the restructuring of global capitalism, but the focus of inquiry remains on the effects of such processes on nation-state building and identity construction—in short, on the implications of transnational phenomena on national and individual scales.⁶⁴ As for political engagement, Shelley Fisher Fishkin’s 2004 presidential address to the American Studies Association is noteworthy, for she positioned a transnational American studies as an alternative site of knowledge “at a time when American foreign policy is marked by nationalism, arrogance, and Manichean oversimplification. . . . [I]t is up to us . . . to provide the nuance, complexity, and historical context to correct reductive visions of America.”⁶⁵ Opinions about the moral duties of technological history will naturally vary, but a transnational turn as such should not prevent historians of technology from fulfilling those duties as they understand them.

A fourth danger is the threat to the gains that social history has made in addressing the histories of individual people, personal experiences, and private spaces regardless of wealth and power. Transnational history, some argue, would lead historians to look at the world of elites instead.⁶⁶ In response, Ian Tyrrell has emphasized that transnationalism should be “a form

61. McGerr (n. 31 above), 1066.

62. Curthoys and Lake (n. 16 above), 14–15.

63. Tyrrell, “Ian Tyrrell Responds” (n. 31 above), 1071.

64. Cristina Szanton Blanc, Linda Basch, and Nina Glick Schiller, “Transnationalism, Nation-States, and Culture,” *Current Anthropology* 36 (1995): 683–86; Alejandro Portes, Luis Guarnizo, and Patricia Landolt, “The Study of Transnationalism: Pitfalls and Promise of an Emergent Research Field,” *Ethnic and Racial Studies* 22 (1999): 217–37.

65. Shelley Fisher Fishkin, “Crossroads of Culture: The Transnational Turn in American Studies—Presidential Address to the American Studies Association, November 12, 2004,” *American Quarterly* 57 (2005): 17–57, at 20.

66. McGerr, 1065.

of the new social history, not a repudiation of it.”⁶⁷ It ought to incorporate a humanistic perspective in a grand narrative, exploring how people change and are changed by history. The viability of this possibility is amply demonstrated in transnational migration histories, which often take individuals, their lives, and their support networks as the units of analysis.⁶⁸ Current experiments in a transnational history of technology underline this point; they may focus on a technical or business elite working in international organizations, but also on bus passengers, truck drivers, and shopping tourists crossing borders, or on the reception and appropriation of foreign technologies and consumption practices by consumers.⁶⁹

A fifth potential risk lies in replacing nation-centered historiography with another essentialized scale—the globe, for example, or the European Union. Such essentialism may be accompanied by an unwarranted teleology, presenting the history of border crossings and transnational encounters as ever-progressing cooperation and integration.⁷⁰ It could also inspire a view that transnational history itself represents a higher form of history, an evolution that leaves outdated national and local historiography behind. A good example of this danger is William Robinson’s proclamation of transnational studies as the new paradigm in the social sciences, an epistemological shift to match globalization’s “supersession of the nation-state as primary form of social organization.” Henceforward, transnational social structure should be the appropriate unit of macrosociological analysis.⁷¹

Perhaps historians are less prone to fall into this trap; challenging teleological assumptions is at the core of their trade. They would also be reluctant to betray the “pluralist bargain,” by which different topics—people, cities, regions, nations, global society, nature—are all deemed worthy of professional scholarly inquiry.⁷² Several transnational history manifestoes warn explicitly against essentialism and teleology. Thomas Bender, for instance, maintained that “in seeking a respatialization of historical narrative in a way that will liberate us from the enclosure of the nation, it is important that we avoid imprisoning ourselves in another limiting conceptual box

67. Tyrrell, “Ian Tyrrell Responds,” 1071.

68. See Portes, Guarnizo, and Landolt.

69. See the descriptions of several ongoing research projects at <http://www.inventingeurope.eu>, in particular the research programs “European Ways of Life in the American Century: Mediating Consumption and Technology in the Twentieth Century” and “Experiencing ‘Europe’ on the Road: Transnational Bus Travel and the Making of ‘Europe,’” and the Ph.D. program “The Hidden Integration in Central, Eastern and South-eastern Europe.”

70. Clavin (n. 13 above), 424.

71. William I. Robinson, “Beyond Nation-State Paradigms: Globalization, Sociology, and the Challenge of Transnational Studies,” *Sociological Forum* 13 (1998): 561–94, at 564. Robinson mentions and rejects teleological reasoning (582–83), but his overall argument and language contradict that caveat.

72. McGerr (n. 31 above), 1065.

... we would do better to imagine a spectrum of social scales, both larger and smaller than the nation and not excluding the nation.⁷³ Saunier likewise warns against a transnational history that adds a new scale above the national, and instead he advocates moving across established categories.⁷⁴

The Tensions of Europe intellectual agenda provides an antidote to essentialism and teleology in its insistence on querying technological integration and fragmentation simultaneously. This approach obviously derives from the historian of technology's view of technological change as a negotiated, contested, and often failing process, and it constitutes a fruitful contribution of technological history to transnational history. It would suggest a transnational history of technology that deliberately spotlights success as well as failure, inclusion as well as exclusion of countries, areas, and social groups from transnational technical collaborations.⁷⁵

A heightened critical awareness may still furnish insufficient protection against a sixth danger, the problem of reflexivity. How does the very act of doing transnational history affect its research objects? If national historiography was for a long time the handmaiden of nation building, can transnational history avoid becoming a handmaiden of internationalism and the United Nations agenda, globalization and global capitalism, or European integration?⁷⁶ Even when investigating these phenomena critically, the very shifting of the historian's gaze to new topics has real consequences in the outside world, if only inasmuch as it helps emphasize new categories more than old ones. In the past, it should be remembered, even critical studies of nationalism may have strengthened the dominance of nation-centered analysis simply by foregrounding this particular category of lived history.

The nation-state version of the reflexivity problem also spotlights a seventh challenge for transnational history. Michael Werner and Bénédicte Zimmermann argue that national reification remains widespread, even in transnational history. They criticize in particular transfer history, an early form of transnational history focused on cross-border flows, for its use of fixed national categories—as in, for example, the transfer of urbanization patterns between Great Britain and Russia. Such studies may aim to show that national borders were permeable, yet the nation-state sneaks in through the back door in the form of the conceptual units between which transfers occur, implicitly telling readers that the national remains the fundamental analytical category after all. Transfer studies thus “only reinforce the prejudices that they seek to undermine.”⁷⁷ Werner and Zimmermann's response, which they term *histoire croisée*, explicitly thematizes its own his-

73. Bender, “Historians, the Nation, and the Plentitude of Narratives” (n. 31 above), 8.

74. Saunier, “Going Transnational?” (n. 14 above).

75. Schot, “Tensions of Europe” (n. 7 above).

76. McGerr, 1066; Saunier, “Going Transnational?”

77. Werner and Zimmermann (n. 34 above), 37.

toricity and relationships between researcher, research categories, and research object. It remains to be seen, however, if that reflective approach will inspire empirical studies in the same way that the grand promises of transnational history did.

The reproduction of national categories is also quite common in current experiments with a transnational history of technology. It surfaces, for instance, in studies of the infrastructural linking, delinking, or nonlinking of nation-states, and of collaborations between two or more countries in transnational projects. It may also take the form of “banal nationalism,” in Michael Billig’s phrase: the “ideological habit” of constantly and casually flagging national properties at the expense of other allegiances.⁷⁸ Engineers, entrepreneurs, companies, and products (not to mention fellow historians) are routinely classified as American, British, German, French, Dutch, and so on, not only because they appear as such in the sources (which would make the label legitimate) but also because authors add these adjectives to provide context for their readers. Such attributions go largely unnoticed by both author and reader, and they cannot easily be avoided if one wants to write an intelligible narrative.

An eighth and final pitfall emerges not from the literature on transnational history but in conversation with historians of technology.⁷⁹ Does transnational history risk a return to internalist history of technology—that is, a history of technology highlighting the global progression of specific technological designs, abstracted from political and cultural contexts?⁸⁰ Internalism may have its merits, but such a movement would certainly inspire controversy.⁸¹ Dispensing with the image of technology as a context-independent, autonomous force in modern society, and developing in its place more nuanced understandings of how design trajectories and societal context intertwine, has been counted among the major advances of the field for decades. Yet following what we today call “transnational actors” as scientists and engineers, easily crossing borders while building their international communities, sciences, or technologies, comes close to what internalist history of science and technology has always done.

Emerging research agendas for transnational history of technology, however, show no sign of undermining this concern for technology’s situated and negotiated character. Rather, they seek to transnationalize contextualist history, expanding the understanding of how technology interacts with local and national contexts to include international ones. Thomas

78. Michael Billig, *Banal Nationalism* (London, 1995), 6.

79. I thank Gerard Alberts and Pierre Mounier-Kuhn for raising this point at the “Inventing Europe—Software for Europe” workshop in Grenoble, January 2008.

80. John M. Staudenmaier, S.J., *Technology’s Storytellers: Reweaving the Human Fabric* (Cambridge, Mass., 1985), 10–11.

81. On the merits of internalism, see Terry S. Reynolds, “On Not Burning Bridges: Valuing the Passé,” *Technology and Culture* 42 (2001): 523–30.

OCTOBER

2008

VOL. 49

Misa's research agenda for the history of computing, to take only one example, spotlights "local circumstances and distinct cultures" shaping computing artifacts and practices, as well as the long-term processes in which computing "shaped the world."⁸² The transnational history of technology exemplified by *Tensions of Europe* likewise situates technological and societal change together in contexts ranging from cities to transatlantic and postcolonial relations.

The risks, I believe, can be dealt with or lived with. The promise of transnational history of technology seems too bright to decline. Only time will tell if it will manage to be intellectually stimulating, historiographically productive, and able to deal adequately with the dangers accompanying this new line of inquiry. Current developments in the history of technology in Europe suggest that it may well be worth the effort.

82. Thomas J. Misa, "Understanding How Computing Has Changed the World," *Annals of the History of Computing* 29 (2007): 52–63, on 52.