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What is Global History of Technology (good for)?

by

FRIEDRICH N. AMMERMANN

ABSTRACT

Despite the large role that technology plays in many Global History studies, a self-styled 'Global History of Technology' has been emerging only recently. Given that technology is not easily contained in national frameworks, global history lends itself easily to histories of technology. What is still largely missing, however, is a conceptualisation of what a 'Global History of Technology' which brings both strands together could contribute, to either discipline and as a whole. This gap is at the centre of this essay. After sketching the key ideas and development in Global History and the History of Technology, this essay outlines how a Global History of Technology could look, what it might ask, and which terms it might use. Finally, it is argued that Global History and History of Technology complement each other in many ways, and that new terms can help to sharpen Global History arguments and to provide (non-Eurocentric) 'fresh perspectives' on technology in the Global South as well as the Western world.

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INTRODUCTION

The discipline – or rather perspective – of Global History has had a remarkable career in the last two decades. Following a renewed interest in the history of globalisation, Global History has been firmly established in the field of historical research since 2000.¹ Global History soon transcended the restricted field of ‘history of globalisation’ and the label ‘global’ has subsequently been attached to a variety of sub-disciplines of historical enquiry (e.g. Global Intellectual History). Arguably, this transfer of ‘global lenses’ to developing new perspectives in established fields was and is the biggest success of Global History as an approach. It is surprising, therefore, that despite the large role different technologies play in a plethora of global history studies, a self-styled ‘Global History of Technology’ is only recently emerging. What is still largely missing, however, is a conceptualisation of what a ‘Global History of Technology’ that brings together Global History and the History of Technology could contribute to either discipline and as a whole.

In order to add to this discussion, I will first outline key

ideas and concepts of Global History as it stands today, highlighting aspects which might be fruitful for the History of Technology. Second, I will give a brief overview over the field of the History of Technology as it developed until the 2000s, with a particular focus on the role of the ‘(inter)national’ in those accounts. In a third step, I will describe what efforts have been made to combine both historical strands by discussing David Edgerton’s *The Shock of the Old* as an example that has been published under the label ‘Global History of Technology’ as early as 2006. Finally, I will outline how a Global History of Technology could look, which questions it might ask, and which terms it might use. The conclusion reflects on the question of what good a Global History of Technology can or cannot contribute, to answer questions in a world increasingly dominated by technology.

GLOBAL HISTORY

Global History has attracted considerable attention since the turn of the millennium, and various attempts to define the approach have been discussed at length.²

1 Richard Drayton and David Motadel, “Discussion: The Futures of Global History,” *Journal of Global History* 13, no. 1 (March 2018): 6, <http://www.cambridge.org/core/journals/journal-of-global-history/article/discussion-the-futures-of-global-history/36C53116D551E0B47E42865EC8DE0C41>.

2 For instance, see Sebastian Conrad, *What Is Global History?* (Princeton, NJ: Princeton University Press, 2016); Roland Wenzlhuemer, *Doing Global History: An Introduction in 6 Concepts* (London: Bloomsbury, 2020) whose monographs are the main references for this essay. Other influential discussions on Global History include: Jeremy Adelman, “What Is Global History Now,” *Aeon* 2 (2 March

It seems, however, that pioneers of the field deliberately keep the definition open.³ The minimal consensus among global historians therefore remains that connections, entanglements, and cross-border flows of goods, people, and ideas form the field's core.⁴ In the following, I will sketch some of the key ideas of Global History by discussing Sebastian Conrad's emphasis on 'integration' in his influential book

What is Global History and Roland Wenzlhuemer's concept of 'transit' in his recent monograph on *Doing Global History*.

To begin with, 'connections' remain at the heart of Global History, and both Conrad and Wenzlhuemer state that it is crucial to qualify them.⁵ Detecting some obscure relationship is not sufficient, unless a certain 'impact' or 'transformation' of that connection, i.e. causality, can be established.⁶ Conrad calls this the 'degree of integration,'⁷ which can be measured by whether changes on one end have an impact on the other.⁸ The notion of 'integration' assumes a crucial position in Conrad's book; he calls integration the "methodological choice that distinguishes global history from other approaches that operate on large scales."⁹ Rather than only investigating connectivity, evaluating integration can bring power relations back into the discussion, as not all ends of a connection are similarly influential, and takes arguments about causation to a global level.¹⁰

Wenzlhuemer argues against this focus on globally integrated phenomena and instead calls for a global-history-as-perspective approach. While agreeing that 'transregional connections' are the centrepiece of Global History and should be weighed and qualified,

2017), <https://aeon.co/essays/is-global-history-still-possible-or-has-it-had-its-moment>; Pamela Kyle Crossley, *What Is Global History?* (Cambridge, UK: Polity, 2008); Patrick O'Brien, "Historiographical Traditions and Modern Imperatives for the Restoration of Global History," *Journal of Global History* 1, no. 1 (March 2006): 3–39, <http://eprints.lse.ac.uk/26471/>; Dominic Sachsenmaier, *Global Perspectives on Global History: Theories and Approaches in a Connected World* (Cambridge, UK: Cambridge University Press, 2011).

- 3 As Jürgen Osterhammel emphasised in a recent discussion with researchers at the EUI (Jürgen Osterhammel, "Conversation with Jürgen Osterhammel" (Core Seminar, Department of History and Civilization, European University Institute, Fiesole, 31 October 2019). See also Roland Wenzlhuemer's closing remarks that 'openness [reflected in the concepts and analytical tools] is indeed the highest value' in Wenzlhuemer, *Doing Global History*, 176.
- 4 In a rather radical manner, Osterhammel defined a limit of global history in the same discussion (Osterhammel, "Conversation with Jürgen Osterhammel"): Asked how historians should include the people/things that do not move, Osterhammel advised not to call it 'global history', but to research it anyway. Drayton and Motadel instead emphasise that disintegration, interruption, and 'things which do not flow' have always been on the research agenda for global historians (Drayton and Motadel, "Discussion", 9).

5 Conrad, *What Is Global History?*, 64–65.

6 Conrad, 72.

7 Conrad, 68.

8 Conrad, 91.

9 Conrad, 67.

10 Conrad, 72.

Wenzlhuemer asks more about the particularities of a specific connection and less about its 'integration'.¹¹ As opposed to Conrad, who gives little advice on where or whom to look at, Wenzlhuemer specifically emphasises the centrality of actors as *they*, in his opinion, lend substance to connections and are the points in time and space where these contacts converge and play out.¹² This actor-centrism makes connections visible and narrates entertaining stories—and can bear the danger of overloading individual actors with global connections and meanings.¹³ Apart from his actor-centrism, Wenzlhuemer introduces 'transit' as another, and arguably his most original, contribution to making Global History feasible. The idea behind 'transits' is to closely examine the *connection*, taking it seriously as a mediator in and of itself, rather than thinking of the connection only from its ends.¹⁴

This fundamental interest in connections—and the assessment of their impact—is based on the conviction of global historians that 'historical units', whether they be societies, nations, or kinship-groups, can only be understood by looking

at their interactions with each other.¹⁵ The 'nation', for instance, is therefore only one level of analysis among many for global historians; indeed, overcoming the 'national container' as the exclusive unit of historical analysis is a key concern within Global History. Another key concern is to avoid the methodological privileging of one world region over others, as is the case with Eurocentrism.¹⁶ Europe is therefore neither the centre of the world nor—and this is a crucial point for the history of technology—the exclusive 'locus of innovation.'¹⁷

Global History as a distinct approach therefore has a specific focus on connections (and integration) beyond the nation-state and a decidedly non-Eurocentric agenda. As we will see in the following sections, both lend themselves easily to a combination with the History of Technology.

HISTORY OF TECHNOLOGY

It is interesting to note that Conrad and Wenzlhuemer both acknowledge the crucial role (European) technology has played in integrating the globe. Conrad identified technology as "one of the most powerful narratives explaining the emergence of global cohesion,"¹⁸

11 Wenzlhuemer, *Doing Global History*, 5, 20.

12 Wenzlhuemer, 93.

13 See for instance Wenzlhuemer's story of the mutiny on the *Bounty* (Wenzlhuemer, chap. 5.), which he embeds in global developments that reminds us of an 'everything is connected'-approach, while struggling to prove convincingly how far those caused the mutiny.

14 Wenzlhuemer, 163.

15 Conrad, *What Is Global History?*, 65.

16 Conrad, 3–4 and Wenzlhuemer, *Doing Global History*, 1.

17 Conrad, *What Is Global History?*, 74.

18 Conrad, 103.

although he remains skeptical of its explanatory potential. On the other hand, Wenzlhuemer's book is deeply technological, with telegraphs and steamers playing prominent roles.¹⁹ Neither one, however, discusses the history of technology, and both only touch upon the potentials of a global history of technology without calling it such.

This lack of attention to technology in global history may be related to the fact that speaking of the 'history of technology' is not as straightforward as it sounds. The trouble with defining History of Technology starts exactly with the term 'technology'. Scholars criticise that the term is used simultaneously to describe very specific technical solutions as well as the entirety of human tools to accomplish objectives, often entailing the perception that it is technology that drives the history of man (and quite literally so for a long time, as the history of technology had an immense gender bias).²⁰ Historian of technology David Edgerton, for instance, called the term 'a brain macerating concept' and decided

at some point in his scholarly career to abandon it altogether in his publications. He now speaks of concrete objects, or if he needs a more open term, of 'things'.²¹ For the purpose of this article, I shall keep to a broad definition of 'technology' which describes a multitude of practical, often physical, and purposeful applications of knowledge.

The field of 'history of technology' itself dates back to at least 1900 and mainly introduced readers to important inventions in human history, alongside their genius creators.²² The stories became less optimistic, emphasising the potentially negative, deterministic role of large technologies in the 1930s and 1940s, foreshadowing a social history approach to the history of technology.²³ The field further solidified (and Americanised) with the founding of the Society for the History of Technology (SHOT) in 1958, but was mostly confined to Cold War narratives of free technological development inherently leading to a Western-style

19 Wenzlhuemer, *Doing Global History*, 13.

20 For a discussion of the term 'technology' see: Leo Marx, "The Emergence of a Hazardous Concept," *Technology and Culture* 51, no. 3 (July 2010): 561–77, <https://www.jstor.org/stable/40927986>; Eric Schatzberg, *Technology: Critical History of a Concept* (Chicago and London: University of Chicago Press, 2018). For an account of technology's role in world's history see for instance: Arnulf Grübler, *Technology and Global Change* (Cambridge, UK: Cambridge University Press, 1998).

21 David L. Edgerton, *The Shock of the Old: Technology and Global History since 1900*, 2nd ed. (London: Profile Books, 2019), xi–xii.

22 T.P. Hughes, "History of Technology," in *International Encyclopedia of the Social & Behavioral Sciences*, ed. Neil J. Smelser and Paul B. Baltes (Philadelphia, PA: Elsevier, 2001), 6852. One example: Samuel Smiles, *Lives of the Engineers* (New York: Scribner, 1905).

23 See for instance: Siegfried Giedion, *Mechanization Takes Command*. (New York: Oxford University Press, 1948).

democratisation.²⁴ Nevertheless, the scope of approaches diversified during this period, and in particular the social and cultural conditions under which innovators invented technology moved to the centre of many studies.²⁵ Historians of technology reached a breaking point in their field in the 1980s, when they moved away from teleological stories of (inherent) progress and techno-determinism.²⁶ New approaches paid attention to the ‘social construction of technology’,²⁷ and Michael Adas famously showed how technology became the prime measure for the West to assert its supremacy.²⁸ Other historians uncovered stories of (active) users and consumers, with a distinct interest in marginalised actors such as women or non-Westerners.²⁹

Taking these actors seriously, a subsequent shift from innovation to use and repair has taken place in recent years.³⁰ In a 2003 study, for instance, Dale Rose and Stuart Blume showed how citizens assumed an active role as (non) users of vaccinations, thus complicating state-led top-down vaccination initiatives.³¹

Countless studies that were produced during the different periods outlined above were told within national borders, often making claim to the singularity of (or the development in) one particular nation. The arguments for national singularity based on a history of technology can roughly be divided into two groups. The first group emphasises invention, attempting to show how a specific national feature

24 John M. Staudenmaier, “Rationality, Agency, Contingency: Recent Trends in the History of Technology,” *Reviews in American History* 30, no. 1 (2002): 168, <https://www.jstor.org/stable/30031729>.

25 Staudenmaier, 168. This emphasis on social and cultural approaches was reflected in the name of SHOT’s journal “*Technology and Culture*”, which was launched in 1959.

26 Staudenmaier, 170.

27 Trevor J. Pinch and Wiebe E. Bijker, “The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other,” *Social Studies of Science* 14, no. 3 (1984): 399–441, <https://doi.org/10.1177/030631284014003004>.

28 Michael Adas, *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance* (Ithaca, NY: Cornell University Press, 1989).

29 See for instance: Ronald Kline and Trevor Pinch, “Users as Agents of Technological Change: The Social Construction of the Automobile in the Rural United States,” *Technology and Culture* 37, no.

4 (1996): 763–95, <https://www.jstor.org/stable/3107097>; Ruth Oldenziel, “Man the Maker, Woman the Consumer: The Consumption Junction Revisited,” in *Feminism in Twentieth Century Science, Technology, and Medicine*, ed. A.N.H. Creager, E. Lunbeck, and L. Schiebinger, *Women in Culture and Society* (Chicago: University of Chicago Press, 2001), 128–48, <https://research.tue.nl/en/publications/man-the-maker-woman-the-consumer-the-consumption-junction-revisit>.

30 See for instance: Stefan Krebs and Heike Weber, eds., *Histories of Technology’s Persistence: Repair, Reuse and Disposal*. (Bielefeld: transcript Verlag, 2020).

And the following discussion of David Edgerton’s pledge for use-based history and maintenance.

31 Dale Rose and Stuart Blume, “Citizens as Users of Technology: An Exploratory Study of Vaccines and Vaccination,” in *How Users Matter: The Co-Construction of Users and Technologies*, ed. Nelly Oudshoorn and Trevor Pinch, *Inside Technology* (Cambridge, MA: MIT Press, 2003), 103–31.

made a nation specifically innovative and thus successful.³² A second, less innovation-centered strand tries to demonstrate how a technology in one country developed in a particular way.³³ It is noteworthy, however, that studies in technology were not necessarily confined to national borders. While having a strong bias towards ‘Western’ technology, the History of Technology never became a field of exclusively national stories and explanations, but throughout remained open for regional and world historical accounts of technological development.³⁴ The genre of a ‘History of Technology’ (i.e. a story of inventions in human history) made it necessary to look at various places of invention around the globe, often in timeframes that complicated national story-telling (which modern nation could plausibly

claim descent from the inventors of the fist axe or the wheel?) A focus on ‘modern’ technology (starting with the invention of the printing press or the steam engine) made such claims much more feasible, but the fact that technology continued to be developed, diffused, and used in different places makes it difficult to confine nationally.³⁵ Most people will agree that the steam engine was developed in Britain—but how long can one convincingly speak of a solely British technology? The effects of such technology are even more ambiguous: for example, the railway, powered by steam engines, has been credited with fostering the national,³⁶ as well as the transnational.³⁷ Somewhere between these discourses, but in no way contradictory, different technologies played a crucial role in colonialism, imperialism, and globalisation.³⁸ But does that make the History of Technology global, and what could a Global History of Technology look like?

32 David Edgerton, “From Innovation to Use: Ten Eclectic Theses on the Historiography of Technology,” *History and Technology* 16, no. 2 (January 1999): 117, <https://doi.org/10.1080/07341519908581961>. See for instance: Richard Nelson, *National Innovation Systems: A Comparative Analysis* (New York: Oxford University Press, 1993).

33 One example regarding aviation history is Tunde Decker, *A History of Aviation in Nigeria, 1925-2005* (Lagos: Dele-Davis, 2008).

34 A survey of the various editions of Bloomsbury Academic’s book series “A History of Technology” (33 volumes since 1976) for instance shows a fairly equal distribution between issues on regional, national, or topical themes. For an example of a world historical approach on the social conditions of innovation see: George Basalla, *The Evolution of Technology* (Cambridge, UK: Cambridge University Press, 1989).

35 Edgerton, *The Shock of the Old*, 122.

36 See Ian J. Kerr, *Engines of Change: The Railroads That Made India*, Moving through History: Transportation and Society Series (Westport, CT: Praeger, 2007).

37 See Irene Anastasiadou, *Constructing Iron Europe. Transnationalism and Railways in the Interbellum* (Amsterdam: Amsterdam University Press, 2016).

38 See Daniel R. Headrick, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (New York: Oxford University Press, 1981).

TOWARDS A GLOBAL HISTORY OF TECHNOLOGY

The methodological exchange between the disciplines has been scarce and was mainly initiated by historians of technology recently, who felt the need to respond to some approaches and claims of global history.³⁹ Overall, the History of Technology was comparably late and cautious to incorporate approaches of Global History. In 2013, Matthias Heymann noted in an extensive review of new German and English language publications within the History of Technology that the field of a transnational or global history of technology remains largely open and to be explored in the future.⁴⁰ In the same year, Dagmar Schäfer and Marcus Popplow came forward with a more pronounced critique of global history approaches, arguing that Global History employs an overly functionalist understanding of technology merely as a catalyst of globalisation.⁴¹ They instead

emphasise that objects are also being altered by processes of globalisation and call for a closer investigation of them in specific contexts.⁴² Schäfer and Popplow warn that the application of Western standards of technology globally will result in stories of deficits, but they express the hope that a more local, non-Western history of technology might also open up fresh perspectives on Western technology.⁴³ Eike-Christian Heine and Christian Zumbrägel stay back behind that research agenda in their 2018 contribution, but emphasise the need for a global history of technology to develop new, meaningful terms to explain specific and local technological solutions.⁴⁴ The most comprehensive and recent discussion of ‘global histories of technology’ was presented by Ute Hasenöhr, who identified three main topics for further inquiry: global history as a history of connections; new histories of infrastructures and Large Technological Systems; and bottom-up, user-based global microhistories.⁴⁵ Her emphasis on

39 Ute Hasenöhr, “Globalgeschichten Der Technik”, in *Provokationen Der Technikgeschichte. Zum Reflexionszwang Historischer Forschung*, ed. Martina Heßler and Heike Weber (Paderborn: Verlag Ferdinand Schöningh, 2019), 158.

40 Matthias Heymann, “Konsolidierung, Aufbruch Oder Niedergang? Ein Review-Essay Zum Stand Der Technikgeschichte,” *NTM Zeitschrift Für Geschichte Der Wissenschaften, Technik Und Medizin* 21, no. 4 (2013): 422, <https://doi.org/10.1007/s00048-014-0110-z>.

41 Dagmar Schäfer and Marcus Popplow, “Einleitung. Globalisierung, Kulturvergleich und transnationaler Techniktransfer

als Herausforderung für die Technikgeschichte,” *TG Technikgeschichte* 80, no. 1 (2013): 4, <https://doi.org/10.5771/0040-117X-2013-1-3>.

42 Schäfer and Popplow, 10.

43 Schäfer and Popplow, 11.

44 Eike-Christian Heine and Christian Zumbrägel, “Technikgeschichte,” 20 December 2018, 24–25, <https://zeitgeschichte-digital.de/doks/frontdoor/index/index/docId/1319>. For a discussion of ‘creole technologies’, see later in this chapter.

45 See Hasenöhr, “Globalgeschichten Der Technik”.

infrastructures (an old field within the History of Technology) is convincing, as infrastructures form the often unnoticed basis of modern life. Shedding light on the workings and rationales of infrastructures (and its planners, builders, and maintainers) allows for a better understanding of top-down channeling attempts and the evolving practices of its users. Particularly conclusive is Hasenöhr's call for a commodity chain analysis 'from cradle to grave', as it fosters a combined discussion on the intersecting histories of technology, business, and the environment.⁴⁶ This not only brings environmental impacts back into the picture, but also emphasises the power relations of production and distribution of excess profits.

In order to move beyond these general outlooks on a Global History of Technology, I am now turning to a more practical example. As mentioned previously, technology features prominently in a plethora of Global History studies, and the History of Technology has taken a global perspective ever since. Few studies, however, explicitly define themselves as Global Histories of Technology. I identified only one book which carries both approaches in its title: David Edgerton's *The Shock of the Old: Technology and*

Global History Since 1900.⁴⁷ Although it was published some years ago in 2006, it provides approaches and food for thought on how such a history could look. I will therefore briefly outline some key ideas from *The Shock of the Old* before discussing where a Global History of Technology might go.

The Shock of the Old may not have "shocked" academia, but it nevertheless received considerable attention.⁴⁸ In this monograph, Edgerton makes a very straightforward point: the impact of a piece of technology does not usually reach its zenith immediately after its innovation, but (much) later. It therefore overlaps with older and newer technologies, often creating a contemporaneity—sometimes interdependence—of them.⁴⁹ In order to produce more insightful histories of technology and the world, Edgerton therefore pledges for two shifts of perspective: first, from invention/innovation to use, and second, from the Global North to the

46 Hasenöhr, 153, 171. Investigating the relationship of technology and the environment is not new (for a classic, see: William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W.W. Norton, 1997)), but can be potentially very rewarding from a global perspective.

47 Edgerton, *The Shock of the Old*. Further, a research project with the promising title: "A Global History of Technology, 1850 – 2000 (GLOBAL-HOT)" is currently going on at Technische Universität Darmstadt, led by Mikael Hård.

48 Besides attracting a good number of reviews by peers, his book also gained attention in non-academic publications (see for instance: David Goldblatt, "The Shock of the Old, by David Edgerton. The Past in the Saddle," *The Independent*, 26 January 2007, <https://www.independent.co.uk/arts-entertainment/books/reviews/the-shock-of-the-old-by-david-edgerton-433628.html>).

49 Edgerton, *The Shock of the Old*, 34..

Global South.⁵⁰ The first shift to a use-based history, Edgerton claims, will produce radically different accounts of technologies and their impacts in space and time.⁵¹ His example that an invention-based history would claim 1965 as the year of the internet illustrates this point well.⁵² The shift from the Global North to the Global South then is to be understood as the establishment of a non-Eurocentric agenda upon which he would build in the following years. It is based on the conviction that current narratives about the Global South are not only inaccurate, but that models from the South can help to rewrite the history of modernity in the North.⁵³

Despite its subheading “Technology and Global History since 1900”, Edgerton did not engage with the emerging literature on Global History in 2006, as he openly admits in the preface to the second edition in 2019. Neither does he do so in the second edition, besides his remark that he has now read the literature on Global History with a ‘certain disappointment.’ To him, Global History seems to reiterate “techno-globalist clichés about a shrinking interconnected world” with an overemphasis on circulation and networks, as well as transportation and communication.⁵⁴ Unfortunately,

Edgerton does not elaborate on which direction Global History should take instead, and presents a rather simple perspective on the global. The central part of Edgerton’s idea of the global is that technology is used everywhere around the globe and a use-based history would uncover these global histories.⁵⁵ Together with Edgerton’s concept of ‘creole technologies’⁵⁶—essentially locally adapted foreign technologies—the potential of such a history on a global scale is almost without limits. In his arguably most interesting chapter, Edgerton points further to another potential avenue within histories of technology: the fact that what is being used has to be maintained. Edgerton reminds us that the majority of scientists and engineers are concerned with maintenance and operation of ‘things’ rather than their invention.⁵⁷ He therefore claims that ‘maintenance and repair are the most widespread forms of technical expertise,’⁵⁸ often left to marginal groups operating outside the formal economy.⁵⁹ Whether formal or informal, maintenance is also a business, involving independent mechanics as well as large companies. In that sense, a use-based (maintenance) history of

50 Although Edgerton uses the expression “rich and poor countries,” I decided to use the less dated terminology of “Global North and South.”

51 Edgerton, *The Shock of the Old*, xxi.

52 Edgerton, xix.

53 Edgerton, xv.

54 Edgerton, xv.

55 Edgerton, xxiii.

56 David Edgerton, “Creole Technologies and Global Histories: Rethinking How Things Travel in Space and Time.” *History of Science and Technology* 1, no. 1 (2007): 75–112, http://www.johost.eu/vol1_summer_2007/vol1_de.htm.

57 Edgerton, *The Shock of the Old*, xxv.

58 Edgerton, 80.

59 Edgerton, 77, 80.

technology has the potential to tell stories about people and their interaction with technology on all social levels around the globe.

Overall, Edgerton points towards a local, use-based history of the appropriation of technology with particular attention to the Global South. He seems less concerned with the identification of global connections besides the fact that a certain technology at some point diffuses into a region where it had not 'originally' been invented. A Conradian integration of appropriated technologies in a global network is no requirement to call a history 'global'. This is both a strength and a weakness of this approach. It can be a strength because it allows for stories of disconnection to be told (for instance, in the case of a technology that is so profoundly appropriated locally that it barely resembles the 'original' technology anymore) or of similar, yet unconnected processes of appropriation. It can also be a weakness, as existing global ties and their impacts might be overlooked.⁶⁰ This even raises the question of whether such a history without connections should be called Global History.⁶¹ One way to mediate between the disconnected and the

integrated can be the study of maintenance. A closer look at groups of actors such as maintenance experts or spare parts traders could unearth fascinating stories, reconnecting the local with the global. Following these stories can (and should) also bring the question of power back into the History of Technology. Questions such as who finances maintenance, who owns the technology, who has the patents and the operational knowledge, and who defines the terms of use and regulation need answering.

From that angle, a Global History of Technology seems to pave a clear path into the future inquiry of the local and specific on a global scale. Actors of local appropriation, maintenance, and repair in the Global South could therefore become the new protagonists of the history of technology. The findings of these bottom-up approaches can then be applied to the Global North to possibly identify similar processes of appropriation, or 'migrated' technology, there.

Although this seems to neatly lead into a local history of the global, I would like to raise four dimensions of a Global History of Technology that should not be forgotten (and have been worked on previously). First, at least since the 20th century most goods, among them machines, were produced transnationally and at times globally. One example is the Volkswagen Beetle that was physically and culturally a global

60 Edgerton provides the example of the rickshaw which, after being developed in Japan in the 1870s, spread to China, India, and every other country in south and east Asia, eventually finding its way onto the streets of London. See Edgerton, 46–47.

61 See Osterhammel's remark on disconnection and immobility in footnote 4.

product.⁶² A Global History of Technology should “follow the thing”⁶³ with an eye on the power relations of its production. Second, despite going into the local, the dimension of Conradian integration should still be kept in mind. For example, by doing a microhistory of one harbour, the story of the container that changed entire flows of goods can hardly be uncovered.⁶⁴ Third, we must avoid falling into the pitfalls of teleological narratives, especially ones that overemphasise connectedness within global history. Instead, we must pay attention to the creation of disconnections as well. The telegraph is one example where the connectedness of one place can easily become the disadvantage of another. Weapons are another hitherto underrepresented technological player in the (dis-) connection of the globe.⁶⁵ It is this disconnection that leads to the fourth and final point I want to raise here: to reiterate Wenzlhuemer’s concept of ‘transit’, we should take the connections themselves seriously. Both how a technology establishes and influences a connection (be it the steamship or the telegraph) *and* how technologies themselves travel

62 See Bernhard Rieger, *The People’s Car: A Global History of the Volkswagen Beetle* (Cambridge, MA: Harvard University Press, 2013).

63 Conrad, *What Is Global History?*, 121.

64 See Marc Levinson, *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger* (Princeton, NJ: Princeton University Press, 2006).

65 Edgerton, *The Shock of the Old*, 116.

and evolve in the process need to be studied.

In order to move towards such a Global History of Technology, it is useful to reflect on the analytical terms we use. ‘Appropriation’ and ‘circulation’, for instance, emphasise the understanding that technologies are being changed by their users in different spatial and temporal contexts. David Arnold showed how the sewing machine was locally appropriated in India, while Christiane Reichart-Burikukiye provided the example of how Muslim preachers readily used new railway stations to spread Islam in German East Africa.⁶⁶ Kapil Raj specifically emphasised the transformative conception of the term ‘circulation’ in his 2013 piece.⁶⁷ Furthermore, employing the term ‘circulation’ is an attempt to avoid essentialised notions of ‘pure’ technologies that are inherent to terms such as Edgerton’s aforementioned ‘creole technologies’.⁶⁸ Terms like

66 David Arnold, “Global Goods and Local Usages: The Small World of the Indian Sewing Machine, 1875–1952,” *Journal of Global History* 6, no. 3 (November 2011): 407–29, <https://www.doi.org/10.1017/S1740022811000398>; Christiane Reichart, “The Railway in Colonial East Africa: Colonial Iconography and African Appropriation of a New Technology,” in *Landscape, Environment and Technology in Colonial and Postcolonial Africa*, ed. Toyin Falola and Emily Brownell (New York: Routledge, 2012), 62–86.

67 Kapil Raj, “Beyond Postcolonialism ... and Postpositivism: Circulation and the Global History of Science,” *Isis* 104, no. 2 (1 June 2013): 343, <https://www.doi.org/10.1086/670951>.

68 For a critique of the term see Hasenöhrli,

‘appropriation’ and ‘circulation’ are thus a good start to developing a new and meaningful semantic arsenal for writing a Global History of Technology.

A transformation in analytical terminology not only enables us to shift the focus of histories of technology, but it also helps to prevent Eurocentric analyses—one of the two main concerns of Global History according to Sebastian Conrad. Popularising concepts such as ‘circulation’ and ‘appropriation’ is a move against Eurocentric historiographies, acknowledging definitions of technology according to non-Western standards. This broader understanding of technology, engineering, and innovation (e.g. ‘creative repairing’) can then provide ‘fresh perspectives’ on local histories of the Global South.⁶⁹

CONCLUSION

How then can the fields of Global History and History of Technology profit from each other and what are the potentials of a

Global History of Technology?

Overall, it seems that the two approaches complement each other in many ways. On the one hand, Global History concepts such as ‘integration’ can help historians of technology uncover the large links and networks in which local phenomena are entangled. Wenzlhuemer’s concept of ‘transit’ can help historians analyse these links better and take them seriously as factors in their own right. This emphasis on (long-distance) connections enables historians of technology to make claims outside of the local and specific and indeed, constitutes a *global* history of technology, as opposed to histories of technology around the world.

On the other hand, more nuanced analyses of technologies can be a helpful tool for global historians. The diffusion and local appropriation of technologies, as well as their role in establishing ‘long distance’ connections, make them ideal objects of studies outside the ‘national container’. A history of engineering, maintenance, and repair further provides Global History with a most diverse set of elite and non-elite actors on global, national, and local levels. The inquiry into those local actors and their embedding in larger networks can also shed light on an additional path of doing small scale global histories. However, when following these actors, Global History should also take note of histories of disconnection, decay, and the return of older technologies that so far are rarely on its research agenda. There

“Globalgeschichten Der Technik,” 179. For a discussion on terms, knowledge, and colonialism see Harald Fischer-Tiné, *Pidgin-Knowledge : Wissen Und Kolonialismus* (Diaphanes, 2013).

⁶⁹ For instance, Gabrielle Hecht highlighted the potential of science and technology studies for African history (David Serlin, “Confronting African Histories of Technology: A Conversation with Keith Breckenridge and Gabrielle Hecht,” *Radical History Review* 2017, no. 127 (January 2017): 100, <https://www.doi.org/10.1215/01636545-3690870>).

could also potentially be a global history of disconnection to be written in the future; weapons or border technologies, for example, could be a starting point in that direction. Stories of that type counter David Edgerton's concern that Global History only produces "techno-globalist clichés about a shrinking interconnected world."⁷⁰ When considering the points mentioned above, I argue that a Global History of Technology can help find answers in a time when globalisation is perceived in an increasingly critical light, while dependence on global technology networks only continues to grow.

70 Edgerton, *The Shock of the Old*, xv.