CHAPTER 1

Introduction: Honing Local Techniques in a Globalized World

> One morning we hiked toward the mystical mountain of wealth and happiness. (According to Dayak legend, a god's son slayed his brother here, and his tears and brain transformed into numerous gold nuggets.) […] Here, the Dayak do not only wash the river sand; they also carry out the important work [of gold] extraction in mines and galleries dug through hard rock containing primary deposits. Particularly astonishing and interesting is the fact that the Indigenous do this without any Chinese or European manager. We are witnessing the gold mines of Gunung Mas, probably the only one of its kind in the Malay archipelago.[1] […]
>
> With great skill, they follow the gold veins impressively far down, break the rock (it should be noted in passing that they employ mallets and chisels of German origin and work in the light of German storm lanterns); transport it in panniers on their backs or along self-made winches to the surface; pound; sift; and wash it; melt it in small, earthen vessels into bars; fashion portions of it into artful jewelry and coveted golden teeth; and sell the rest

[1] Helbig, Karl, "Gold bei den Dajaks," *Ostasiatische Rundschau* 19 (15/16), 1938: 386–390; here: 387. All translations from German into English have been done by the author.

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> to Malay buyers. Who would expect such a highly developed business among the "savage" Dayak, these most infamous of all headhunters![2]

In 1937, the German geographer and explorer Karl Helbig traversed the island of Borneo on foot. The visit to Gunung Mas was one of the highlights of his strenuous journey. From the village of Tewah, where they had spent the night, Helbig and his party followed an overgrown, neglected road through the jungle to Gunung Mas—"Gold Mountain" in the local Dayak language. The sight of the mountain provoked mixed feelings in Helbig. On the one hand, he lauded the industrious activity he and his small group of companions encountered in the middle of the tropical rainforest: an estimated one thousand Dayak and Chinese people were diligently mining and processing gold deposits. On the other hand, Helbig regretted that earlier gold-mining attempts by European companies had failed. He wrote of his nostalgia for old steam engines and "hefty cogwheels," which were now obscured by "high grass," and he used his camera to document the contrast between the contemporaneous industriousness and the industrial "ruins" of earlier times.[3]

This vignette from the colony of the Dutch East Indies—today's Indonesia—reproduces prejudiced and racist worldviews. Despite Helbig's acknowledging words about Dayak industriousness, the quote from his diary reflects standard European narratives of the time. Two of the most common parables in European historical sources are "uncivilized people" and "underdeveloped countries." Such story lines classified various parts of the world in accordance with a racist, evolutionary logic.[4] According to this biased thinking, European and North American people are typically placed at the top of the pyramid of development; they are followed by Chinese and Indian people, and other members of previous so-called

[2] Helbig, Karl, "Fahrt ins Dunkel. XI: Eine Reise durch Borneo," unpublished travel report (1937/38), in: Roemer- und Pelizaeus-Museum Hildesheim GmbH, Hildesheim, Germany: File No. K. 09: 9.4: "Fotos v. K. Helbig, Java, Borneo, Sumatra (I+II)," p. 19. Dr. Mai Lin Tjoa-Bonatz has been kind enough to provide me with published and archival material from Karl Helbig—including a selection of photographs, in addition to other historical sources about gold processing in colonial Dutch East Indies (today's Indonesia); cf. also Tjoa-Bonatz, Mai Lin, and Mikael Hård, "Creole Objects and Techniques: Gold Mining, Gold Panning and Gold Working in Colonial Indonesia," *Baessler-Archiv* 67, 2021: 67–94.

[3] Helbig, "Gold," 387.

[4] Moon, Suzanne, *Technology and Ethical Idealism: A History of Development in the Netherlands East Indies*. Leiden: CNWS Publications, 2007.

advanced civilizations. At the bottom of the pyramid are what Helbig called "primitive" and other "savage" people.[5]

The quote from Helbig also illustrates the place of tools and machines on this imagined evolutionary and racist ladder.[6] Helbig held to the idea that Western technology represented the zenith of historical development. This idea was particularly ironic: in fact, the rainforest had reclaimed the railroad tracks and bridges built by a Dutch company at the turn of the twentieth century. Also gone was the "heavy machinery" the company had installed, as well as the "big industrial plants" it had erected.[7] The observation that the Dayak miners made use of German implements did not challenge the dichotomy in Helbig's mind between "ancient manual work" and "modern machines."[8]

Although he subscribed to this Eurocentric, colonialist narrative, Helbig appreciated the "simple methods" that the "humble" Dayak profitably employed.[9] As indicated by an extensive photo collection, Helbig appears to have been genuinely impressed by the implements used by the indigenous gold seekers: wooden pans (*dulang-dulang*), bamboo ladders, iron mortars, and clay pots. Further, Helbig was convinced that any European pit foreman would "wonder" how efficiently the workers were able to deploy such artifacts. When it came to the manufacture of gold items, Helbig, similarly, expressed surprise at the beautiful jewelry the Dayak goldsmiths were able to design with their "most primitive tools."[10]

From a contemporary, postcolonial perspective, it is evident that Helbig combined Eurocentric, evolutionary thinking with genuine admiration for the achievements of the Dayak. In his seminal book *Orientalism*, Edward Said provides critical insights into the tendency of European commentators—including philologists, archaeologists, and historians—to romanticize faraway cultures.[11] Unfortunately, the West's fascination with the "Orient" does not mean that Western commentators regard Eastern cultures as equal—or as having reached the same level of development. On

[5] Helbig, "Gold," 388.

[6] Cf. Adas, Michael, *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance*. Ithaca, NY: Cornell University Press, 1989.

[7] Helbig, "Gold," 387.

[8] Helbig, Karl, *Eine Durchquerung der Insel Borneo (Kalimantan): Nach den Tagebüchern aus dem Jahre 1937*, Vol. 2. Berlin: Dietrich Reimer, 1982, pp. 364, 366.

[9] Ibid., p. 366.

[10] Ibid., pp. 366, 437.

[11] Said, Edward, *Orientalism*. New York: Pantheon, 1978.

the contrary, as Said notes, the "enthusiasm" for "the Other" cannot be separated from questions "of power, of domination."[12] In line with such postmodern thinking, I try, in this book, to interpret past ideologies and practices within a critical, anti-imperialist framework.[13]

Coexistence and Culture

Helbig's writings and photos serve as a point of departure for the microhistories I present in this book. Helbig's Orientalist comments have motivated me to develop more convincing accounts of how tools and machines are being used in various corners of the world. Helbig's description of the Dayak goldminers shows us that "simple" tools may well be more appropriate and suitable than advanced, mechanical technologies, and some of his photographs remind us that modern technologies are volatile and transitory.[14] Helbig's nationalistic remark, about the Dayak using German products in the middle of the jungle, illustrates the fact that what he called modern and primitive technologies may very well coexist.

My approach has been affected in fundamental ways by postcolonial thinking and postcolonial history writing.[15] Such perspectives imply questioning and deconstructing dichotomies between "developed" and "underdeveloped" parts of the world, between center and periphery, between "the West and the rest," between the Occident and the Orient, between "advanced" and "primitive" cultures. Although many sources on which this book is based reflect an evolutionary view of human societies and their technologies, the microhistories in this volume do not reproduce such colonial paradigms. Rather than emphasize the impact of Western science and technology in various corners of the world, I recount histories of indigenous developments and cross-cultural encounters, and I analyze processes of hybridization and resistance.[16]

The eight chapters that follow are meant to counteract standard story lines in the global history of technology. The chapters reveal the complex

[12] Ibid., pp. 5, 51.

[13] Sardar, Ziauddin, *Postmodernism and the Other: The New Imperialism of Western Culture*. London: Pluto Press, 1998.

[14] Helbig, *Durchquerung*, p. 365.

[15] Ashcroft, Bill, Gareth Griffiths, and Helen Tiffin, eds, *The Post-Colonial Studies Reader*, 2nd ed. London: Routledge, 2006. Majumdar, Rochona, *Writing Postcolonial History*. London: Bloomsbury, 2010.

[16] Bhabha, Homi K., *The Location of Culture*. London: Routledge, 1994.

character of technological change and use. At the forefront is the idea that inventions do not simply emerge in a particular setting and spread gradually and uniformly across the globe. The common notion of one-way "technology transfer" only rarely describes accurately the relation between various nations or continents in an appropriate manner. Whereas people in one region may adopt innovations willingly, inhabitants in other regions may reject them outright. History teaches us that once-popular technologies can be later discarded.[17] As I will show in several chapters, new technological solutions and long-established technologies were often employed in synergy.[18] As such, I have de-emphasized the idea of new technological solutions that circulate globally; instead, I analyze local technological landscapes and material cultures.[19]

The book's main chapters are organized in rough chronological order. The first three chapters refer to the nineteenth century, a mainly colonial period; these chapters also trace developments to precolonial times. Chapters 5 and 6 focus on the interwar period and the first two decades after the Second World War. Chapters 7–9 are fully rooted in the postwar period. These chapters also examine postcolonial structures and the change they represented. In the concluding chapter, I touch on standard forms of periodization and their presumed usefulness in helping us to understand the global history of technology.

In contrast to the great majority of works in the history of technology, this book investigates the world beyond Europe and North America. By recounting histories from Asia, Africa, and Latin America, I hope to shed light on the rich and varied technological history of these continents. The microhistories in this book are also meant to incorporate recent insights by global historians, and tie local events to regional and global processes.[20] For example, in Chap. 4, I recount the global history of sugarcane cultivation and sugar manufacturing, while showing that the case of Northern India differs substantially from the more familiar histories, from Brazil, Cuba, and Java. Helbig's brief description of Gunung Mas is instructive in

[17] Perrin, Noel, *Giving Up the Gun: Japan's Reversion to the Sword, 1543–1879*. Boston, MA: David R. Godine, 1979.

[18] Edgerton, David, *The Shock of the Old: Technology and Global History since 1900*. London: Profile Books, 2006.

[19] Bray, Francesca, "Flows and Matrices, Landscapes and Cultures," *ICON: Journal of the International Committee for the History of Technology* 22, 2016: 8–19.

[20] Ghobrial, John-Paul, ed., "Global History and Microhistory," *Past & Present*, Supplement 14, 2019 (special issue).

that it illustrates the transient nature of Western influence and presence. In addition, it shows that Chinese goldminers and traders had for centuries been active in Kalimantan—the part of Borneo that belongs to today's Indonesia. The region had been an integral part of a trans-Asian gold trade network well before the Dutch arrived.[21]

Reclaiming the Term Technology

Standard definitions of the word technology pose a challenge for anyone interested in developing a global history of technology.[22] Today, "technology" is strongly associated with smartphones, computers, and other digital, high-tech solutions. In contrast to this connotation, this book embraces every form of technology, from the pejoratively named "low-tech" solutions to the often exalted "high-tech" ones. That means the metal mortar-and-pestle used by the Dayak people to crush rock fragments assumes the same status as the steam-driven grinding machine installed on Gold Mountain by the Dutch company Mijnbouw Maatschappij Kahajan. Indeed, we are obliged by history to use the word technology for any artifact or system and the knowledge and skill employed to use it.

Burong soho was one of the many technologies employed by gold workers in Kalimantan. According to geologist Theodor Posewitz, *burong soho* was a "special kind of bird" which was used as a kind of "dowsing instrument" in the search for gold deposits.[23] When the gold seekers approach an area rich in gold, the bird "begins to sing." Another technology employed was the "witchcraft basket"—as missionary Hugo Haffner somewhat contemptuously called it—which was placed at the entrance of a newly opened pit to "ask the spirits for their blessings."[24]

The technologies which Posewitz and Haffner called "a special kind of bird" and "witchcraft basket" were part of the Dayak goldworkers' toolkit, along with bamboo ladders and clay pots. Miners used spades to dig mines, crowbars to break rock into smaller pieces, and stone hammers and

[21] Posewitz, Theodor, "Das Goldvorkommen in Borneo," *Mittheilungen aus dem Jahrbuche der kön. ungarischen geologischen Anstalt* 6, 1883: 175–190.

[22] Schatzberg, Eric, *Technology: Critical History of a Concept*. Chicago, IL: University of Chicago Press, 2018.

[23] Posewitz, "Goldvorkommen," p. 183.

[24] Haffner, Hugo, "Unsere Dajak auf dem Goldfeld bei Tewah," *manuscript*, 1937, in: Basel Mission Archives/Mission 21, Basel, Switzerland: File No. B-11.04.

anvils to pulverize those pieces.[25] The locals had longstanding experience in using *dulang-dulang* (wooden pans) for gold-panning. According to rumors of the time, some parts of Borneo were so rich in gold that people could use sticks soaked in resin to retrieve gold nuggets from the ground.[26] By contrast, the Chinese miners who in the eighteenth century traveled to Borneo in large numbers created a technical system of excavation sites, dams, waterwheels, and washing channels to exploit deposits close to the surface.[27] In turn, gold-seekers from Europe brought petroleum lamps, steam engines, and locomotives. When Helbig visited Gunung Mas, several—though not all—of these technologies coexisted. Together, these tools and practices comprised Borneo's technological landscape of gold extraction.

I argue that the objects which Europeans labeled "a special kind of bird" and "witchcraft basket" were integral parts of Dayak material culture. Importantly, this culture was dynamic, and, progressively, miners integrated German mallets, chisels, and storm lanterns, for example. Despite their acceptance of these new implements, the Dayak people retained their belief in what Helbig called the traditional "legend" of how the gold had come to Borneo in the first place. The presence of these coexisting technologies and beliefs render it impossible to draw a clear line between the material and immaterial aspects of Dayak culture.

I suggest in this book that we can come to a better understanding of technology if we define it in terms of "material culture."[28] According to Anne Gerritsen and Giorgio Riello, historians of the Early Modern Period, a history of material culture focuses on objects "in the everyday practices that shaped past lives."[29] Although the following chapters describe material cultures in selected regions of Africa, Asia, and Latin America, I recommend we apply the concept of "material culture" to every other region

[25] Posewitz, Theodor, *Borneo: Entdeckungsreisen und Untersuchungen. Gegenwärtiger Stand der geologischen Kenntnisse. Verbreitung der nutzbaren Mineralien*. Berlin: R. Friedländer & Sohn, 1889, pp. 264–265.

[26] Dewall, H. von, "Aanteekeningen omtrent de noordoostkust van Borneo," *Tijdshrift voor indische Taal-, Land- en Volkenkunde* 4, 1855: 423–458.

[27] Jackson, James C., *Chinese in the West Borneo Goldfields: A study in Cultural Geography*. Hull: University of Hull Publications, 1970.

[28] Cf. El Hariry, Shorouk, et al., "Toward a Global History of Material Culture," *Technikgeschichte* 88, 2021: 178–182.

[29] Gerritsen, Anne, and Giorgio Riello, "Introduction: Writing Material Culture History," in: idem, eds, *Writing Material Culture History*. London and New York: Bloomsbury Academic, 2015: 1–13, here: p. 4.

of the world—including Europe and North America. For the historian of technology, applying a material-culture approach implies treating heavily industrialized and less industrialized regions with the same methods—in an unbiased manner.

The microhistory method, too, is universally applicable. From the 1960s onward, when "microhistory" initially developed as a historiographic approach, it was employed almost exclusively by historians of Europe.[30] In sharp contrast to traditional topics like kings, churches, and wars, microhistorians developed an interest in the worldviews and daily lives of ordinary people: *la vie privée* in French and *Alltagsgeschichte* in German.[31] Of paradigmatic importance to the development of *microstoria*—as this approach is called in Italian—is Carlo Ginzburg's analysis of the ideas and convictions of a sixteenth-century North Italian miller.[32] To a large extent microhistory became associated with a cultural approach. For example, German historian Hans Medick applied cultural-historical methods in his impressive work about a small linen-weaving community in southwest Germany.

Microhistories of Technology can be read as an experiment in applying the microhistory and cultural-history approach in Asia, Africa, and Latin America. Methodologically, this book was inspired by Medick's observation that microhistorians unravel "less spectacular events and actions by telling small stories of daily life," and zoom in on the "objects of material culture."[33] As Medick himself shows, however, such an approach does not preclude the investigation of connections between local processes and processes that take place on national—and even international—levels. Medick's book shows that despite substantial structural changes that took place from the eighteenth through the early twentieth centuries, the linen weavers of Laichingen in Württemberg, Germany, stalwartly provided customers in France and Italy with high-quality products. This book does not follow a single community for a century and a half, though it does contain stories about the use of technology in everyday settings from various communities—from the mid-nineteenth to the late twentieth century.

[30] Schulze, Winfried, ed., *Sozialgeschichte, Alltagsgeschichte, Mikro-Historie: Eine Diskussion*. Göttingen: Vandenhoeck & Ruprecht, 1994.

[31] Ghobrial, John-Paul A., "Introduction: Seeing the World like a Microhistorian," *Past & Present*, Supplement 14, 2019 (special issue): 1–22.

[32] Ginzburg, Carlo, *The Cheese and the Worms: The Cosmos of a Sixteenth-century Miller*. Baltimore, MD: Johns Hopkins University Press, 1980 (orig. 1976).

[33] Medick, Hans, *Weben und Überleben in Laichingen 1650–1900: Lokalgeschichte als Allgemeine Geschichte*. Göttingen: Vandenhoeck & Ruprecht, 1996, p. 21.

Protagonists and Sources

Often, material objects outlive human beings. That said, we cannot imagine cultures without people. The protagonists of the following chapters range from Peruvian cooks to Tanzanian electricians, West African kola-nut traders to Indian rural laborers. Given that written historical sources do not always name the various actors, some of the protagonists in these microhistories have been lost to anonymity. Whenever possible, however, I have tried to supplement the archival sources with interviews; for ethical reasons, the interviewees' identities in this research must also remain anonymous.

Most of the microhistories presented in this book rely on sources—including oral sources—provided by doctoral candidates and postdoctoral researchers with whom I have collaborated. Their research experience spans Asia, Africa, South America, and Europe. As detailed in the acknowledgments at the beginning of the book, these colleagues have located and retrieved unpublished and published sources from archives and libraries across the globe. In several cases, the researchers carried out in-person interviews. I gathered material from East African, Western European, and Indian archives and libraries. This book is based on our unique collection of primary-source material, which gives readers insight into the daily practices, tools, and machinery of ordinary people in various cultures.

In all cases, the focus is on people who led "ordinary"—rather than privileged—lives. Inspired by Ginzburg's *microstoria* and Medick's *Alltagsgeschichte*, I argue that historians of technology have a great deal to learn from the way mundane tools are used in everyday settings. Featured here are people who built their own homes with adobe bricks; washed and folded their own menstruation pads; and earned a living brewing beer and making sugar for their communities. And while engineers, scientists, and architects populate these narratives, they are purposely placed on the sidelines. Rather than being set in high-tech laboratories or modernist urban neighborhoods, the stories in this book take place in missionary stations, tropical rainforests, and working-class kitchens, for example.

Anyone who tries to write the history of ordinary people and daily life must contend with the limitations of archives as repositories of research material. National archives tend to be biased toward official documents produced by state institutions; archives seldom contain the writings of ordinary people—making it difficult to write what E.P. Thompson, in his

seminal history of the English working class, called "history from below."[34] Historians who work with archival material in former colonial settings must grapple with another grave problem: only rarely do historians of colonial periods find primary sources produced by members of indigenous populations. The great majority of sources stem from the colonial rulers, and the material reflects the ideas and activities of the local population only indirectly—if at all. The following chapters have been written with these limitations in mind. In addition to using interview material, I refer to written documents and images from travel accounts and diaries, magazines and newspapers, for example. Some of this material comes from individuals' private papers as well as the archives of various nongovernmental organizations.

Each story in this book is based on a carefully selected set of historical sources. Taken together, these microhistories show how differently people approached, developed, and used technology in distinct cultural settings. These microhistories are meant to problematize the notion that the standard global history of technology is one sided and linear, a narrative of growing uniformity and homogeneity. And, as mentioned, while "globalization" and "mechanization" have been important concepts, neither capture the complexities of history. In writing these microhistories, I followed anthropologist Ulf Hannerz's twofold advice that "globalization has to be brought down to earth," and that "the local has to be brought up to the surface."[35] The people described in this book are not isolated from the wider world, nor are their lives determined by this world.

Further, the chapters make fundamental theoretical contributions to our understanding of the character of technology; to the relationship between materiality and culture; and to the global history of technology. For example, in Chap. 4, I use the microhistory of sugar manufacture in Northern India to argue that we need to redefine the well-known concept of "appropriate technology." In Chap. 7, I suggest that concepts such as "slum" and "informal settlement" to describe Nairobi's low-income areas may be better characterized as "flexible settlement." And in Chap. 8, I address the question to what extent the concept of "Americanization"—so often used by historians in reference to post–Second World War

[34] Thompson, Edward P., *The Making of the English Working Class*. London: Gollancz, 1963.
[35] Hannerz, Ulf, *Transnational Connections: Culture, People, Places*. London: Routledge, 1996, pp. 19, 28.

Europe—is helpful in describing the proliferation of consumer goods in South Korea.

This book is not a synthetic work with universal ambitions. Instead, I apply a microhistory approach to provide iconic examples from the global history of technology, from the mid-nineteenth century onwards. Some stories exemplify the innovative power of human beings, while others illustrate the usefulness of hybrid, cross-cultural solutions. Indeed, these stories are meant to expand the historian's geographical horizon; they are also meant to show how the small worlds of local actors are connected to other parts of the globe.