

The Globalization of Knowledge in the Iberian Colonial World

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The Globalization of Knowledge in the Iberian Colonial World

Edited by Helge Wendt

Proceedings 10

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Communicated by Ana Simões and Kostas Gavroglu

Editorial Team: Lindy Divarci, Caroline Frank, Georg Pflanz, Melina Vanni-Gonzalez

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Contributors

Sonja Brentjes (PhD Technical University Dresden, 1977) is a Research Scholar at the Max Planck Institute for the History of Science in Berlin. She has taught at universities in the two German states, Pakistan, the UK, Turkey and Spain and held research fellowships in the Soviet Union, Hungary, France, Germany, USA, the UK and Spain. Her research focuses on a contextualized history of science in Islamic societies, mapmaking and early modern traveling between Europe, western Asia and North Africa. Three of her publications are: *Travellers from Europe in the Ottoman and Safavid Empires, 16th–17th Centuries Seeking, Transforming, Discarding Knowledge; Variorum Collected Studies Series: CS961*, (Farnham, Surrey: Ashgate, 2010), “Teaching the Mathematical Sciences in Islamic Societies. Eighth–Seventeenth Centuries,” in *Handbook on the History of Mathematics Education*, edited by Alexander Karp and Gert Schubring, (New York: Springer, 2014, pp. 85–107); Sonja Brentjes, Alexander Fidora and Matthias M. Tischler, “Towards a New Approach to Medieval Cross-Cultural Exchanges,” *Journal of Transcultural Medieval Studies* 1, 1 (2014), pp. 9–50.

Angélica Morales Sarabia is a Researcher in the History of Science Program at the Centre for Interdisciplinary Research in Science and Humanities at the Universidad Nacional Autónoma de México (UNAM). She is professor of History of Mexico at the Facultad de Ciencias Políticas y Sociales, UNAM. She has published several individual and collective articles and chapters in different books. Among her last works are: “The Culture of Peyote: Between Divination and Disease in Early Modern New Spain,” in *Medical Cultures in the Early Modern Spanish Empire* (2014); “Tres caminos posibles: una ausencia, una marca tipográfica y un evento fortuito. El peyote y otras hierbas en la materia médica siglos XVI–XVII,” in *Geografía médica. Orillas y fronteras culturales de la medicina hispanoamericana (siglos XVI–XVII)* (2014). Her latest book is in press: *La consolidación de la botánica mexicana. Un viaje por la obra del naturalista José Ramírez (1852–1904)* (2015).

José Pardo-Tomás is Senior Researcher in the Department of History of Science in the Institute “Milà i Fontanals” (CSIC, Barcelona, Spain). He has been a visiting scholar at the universities of Padua (Italy), Humboldt (Berlin, Germany), Bordeaux and EHESS (France) and UNAM (México). His research focuses on

the social and cultural history of medicine, natural history and scientific books in the early modern period. His books include: *Ciencia y censura* (CSIC, 1991), *El tesoro natural de América* (Nivola, 2002), *El médico en la palestra* (Marcial Pons, 2004) and *Un lugar para la ciencia* (Fundación Canaria Orotava, 2006), among others. He has co-edited the volumes *Geografías médicas. Orillas y fronteras culturales de la medicina hispanoamericana, siglos XVI y XVII* (UNAM, 2014, with Mauricio Sánchez Menchero) and *Medical Cultures in the Early Modern Spanish Empire* (Ashgate, 2014, with John Slater and Marialuz López Terrada).

Lars Kirkhusmo Pharo 2009, Research Associate, Moses Mesoamerican Archive and Research Project, Harvard University; 2013, Affiliated Scholar, The Centre for Development and The Environment (SUM), University of Oslo; 2015, Research Partner, “Globalization of Knowledge” Max Planck Institute for the History of Science (MPIWG). Research interests: epistemologies, ideas, languages and semiotics (literacy and writing systems) of the Americas. Selected publications: *The Ritual Practice of Time: Philosophy and Sociopolitics of Mesoamerican Religious Calendars* (Brill, 2013); “The Concept of Religion in Mesoamerican Languages,” *NUMEN* 54 (2007); “Concepts of Human Dignity in the Moral Philosophies of Indigenous People of the Americas & The Council of Valladolid (1550–1551): A European Disputation About the Human Dignity of Indigenous Peoples of the Americas,” in *Cambridge Handbook for Human Dignity* (Cambridge University Press, 2014); *Crossing Boundaries: Multilingualism, Lingua Franca and Lingua Sacra* (Edition Open Access, 2016).

Emma Sallent Del Colombo is *Professora Lectora* in the Department of Fundamental Physics of the University of Barcelona and President of the Catalan Society for History of Science and Technology (SCHCT), at the Institute of Catalan Studies (IEC). Her research is concerned with the history of vector calculus and mathematical physics in Italy in the early twentieth century, as well as the history of science and scientific institutions in Catalonia. She is currently working on Ulisse Aldrovandi’s relationship to Spain, and as a member of the project *Cultura médica novohispana: circulación atlántica, recepción y apropiaciones*, she is studying the chronicles of the mendicant orders of Franciscan, Augustinian and Dominican friars in sixteenth-century New Spain as a source of natural history and medicine.

Mauricio Sánchez Menchero is a Researcher at the Center for Interdisciplinary Research in Science and Humanities (CEIICH) of the National Autonomous University of Mexico (UNAM) and a member of the National System of Researchers. He has a degree in Communications from the Autonomous Metropolitan University, and completed his Masters and PhD studies in the history of social com-

munication at the Complutense University of Madrid, Spain. Mauricio Sánchez teaches cultural history to bachelor and postgraduate research students at the UNAM. He is author of the book *El corazón de los libros* (UNAM, 2012), and editor of the books: *Geografías Médicas* (UNAM, 2013) and *La circulación del conocimiento en imágenes* (UNAM, 2014). He also published the chapter “From where they are now to whence they came from: news about health and disease in New Spain (1550–1615),” in J. Slater (ed.) *Medical Cultures of the Early Modern Spanish Empire* (Ashgate, 2014). He is currently working on the research project “The build and circulation of knowledge of the Boston Society of Natural History” (UNAM).

Nuria Valverde Pérez is Professor at the Universidad Autónoma Metropolitana-Cuajimalpa (México). From 2005 to 2008, she was a researcher at the Center for Human and Social Sciences at the Spanish National Research Council. She was also a visiting researcher at the Department of History of Science at Harvard University in 2007. Among her works are *Linnaean Botany and Spanish Imperial Biopolitics* (2005), and *Space Production and Spanish Imperial Geopolitics* (2008), both co-authored with A. Lafuente; *Actos de precisión. Instrumentos científicos, opinión pública y economía moral en la ilustración española* (2007) and *Un mundo en equilibrio. Jorge Juan; 1713–1773* (2012). Her paper “Small Parts: Crisóstomo Martínez (1638–1694), Bone Histology and the Visual Making of Body Wholeness” (2009) was awarded the Derek Price/Rod Webster Prize by the History of Science Society in 2011. Currently, she is doing research on visual technologies and systemic imagination, as well as on standardization and practices in the development of EEGs in the USA and Mexico.

Timothy Walker (B.A., Hiram College, 1986; M.A., PhD, Boston University, 2001) is an associate professor of history at the University of Massachusetts Dartmouth. At UMD, he serves as Fulbright Program Advisor (faculty and students); Associate Director of the Center for Portuguese Studies and Culture (2007–2009) and Director of Tagus Press; a member of the graduate faculty of the Department of Portuguese Studies; and an affiliated faculty member of the Center of Indian Studies and Program in Women’s Studies. Walker is also an Affiliated Researcher of the Centro de História d’Aquém e d’Além-Mar (CHAM); Universidade Nova de Lisboa, Portugal. From 1994 to 2003, he was a visiting professor at the Universidade Aberta in Lisbon. During Fall Term 2010 Walker was a visiting professor at Brown University. Walker is the recipient of a Fulbright dissertation fellowship to Portugal (1996–1997), a doctoral research fellowship from the Portuguese Camões Institute (1995–1996), and a NEH-funded American Institute for Indian Studies Grant for post-doctoral work in India (2000–2002).

Helge Wendt is a Research Scholar at the Max Planck Institute for the History of Science in Berlin, where he is associated with the project “Globalization of Knowledge.” He received his PhD from the University of Mannheim, where he taught early modern history. His research focuses on the history of Christian missions in different colonial contexts, the history and historiography of globalization and the global history of coal. He currently works on the analytic turn of mechanics in the eighteenth century, funded by the Collaborative Research Center “Transformations of Antiquity.” Wendt published a book on the global history of colonial missions *Die missionarische Gesellschaft* (Franz Steiner, 2011) and papers on different aspects of colonial mission history. He is co-editor of *The History of Physics in Cuba* (Springer, 2014). In his current book project, he studies the global history of knowledge of black coal (seventeenth to nineteenth century).

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This volume is the result of a conference, “Transfer of Knowledge in the Iberian Colonial World” held in September 2013 at the Max Planck Institute for the History of Science in Berlin, Germany (MPIWG). The conference was the outcome of various long-term collaborative research projects. Jürgen Renn, director at the MPIWG, initiated the first cooperation with the Fundación Canaria Orotava de Historia de la Ciencia of Tenerife (Spain), especially with its directors José Montesinos and Sergio Toledo Prats. In the collaborative research project “Humboldt Project: Open Digital Research Library” researchers from both institutions published works dealing with political and scientific explorations of the Canary Islands, mainly during the eighteenth and nineteenth centuries. This project also established a database of works and images, as well as libraries holding the works digitized during this project (<http://fundacionorotava.es/humboldt>).

The conference was the third in a series organized by the Fundación Orotava in the frame of the project “Ciencia y Cultura entre dos Mundos,” held previously in La Gomera (Canarias 2007) and Cholula (Mexico 2010) and organized in collaboration with the Consejo Superior de Investigaciones Científicas (CSIC) of Spain. The Berlin conference was part of the ongoing research project at the MPIWG “Globalization of Knowledge,” which studies the globalization of knowledge in history to establish an epistemological framework that enables the systematic analysis of historical processes of technology transfer, the spread of epistemic frameworks, the dynamic relation between local and global knowledge traditions and the globalization of modern science. An edited volume, *The Globalization of Knowledge in History* (Edition Open Access, Berlin) was published in 2012, making visible the potential of this approach to history of science and global history, and providing the first results of the research undertaken in the last ten years.

The conference focused on concepts of knowledge transfer in the history of (scientific) knowledge in the Iberian world. The transfer of knowledge was considered as a process of globalization in its own right. In the Iberian colonial world, traditions of knowledge from all over Europe, Africa, Asia and America converged. The aim of the conference was to trace new bodies of knowledge that emerged in philosophy, natural history and religion to find out how foods and drugs were circulated, and to explore representations of the ‘exotic’ in the

writings and paintings that travelled with actors and objects between different spaces.

The publication of some of the papers given at the conference represents the continuation of the cooperation between the Fundación Orotava, the CSIC and the MPIWG. The publication in Edition Open Access maintains the idea behind the Humboldt Project of making scientific results accessible to a broader public, and is an entry point of the MPIWG's contribution to the research program "Convivencia. Iberian to Global Dynamics (500–1750)."

The editor would like to express his special thanks to Sergio Luis Toledo Prats, the director of the Fundación Orotava, who helped to make the conference and the cooperation possible in a period when the public funding of his institution was endangered. I am very grateful to Jürgen Renn, director at the Max Planck Institute for the History of Science in Berlin, who hosted the conference and encouraged the publication of its results in Edition Open Access of the Max Planck Research Library. Ana Simões and Kostas Gavroglu submitted the publication. Both provided invaluable advice during the publication process. I would like to thank Stefanie Gänger, Florike Egmond, Peter Mason and Antonio Barrera-Osorio who attended the conference in September 2013 and who contributed to the discussions. I would like to express special thanks to Ross Fletcher, Caroline Frank and Melina Vanni-Gonzalez, who helped in copyediting the articles. My thanks go also to Georg Pflanz, who took care of all technical and layouting issues, and Lindy Divarci, who managed the project during the publication process.

Chapter 1

Introduction: Competing Scientific Cultures and the Globalization of Knowledge in the Iberian Colonial World

Helge Wendt

Colonial and Transcolonial Transfer of Knowledge

The globalization of knowledge in the Iberian colonies is a subject that in the last forty years has been approached from many different perspectives. Nevertheless, it is still important to investigate this knowledge formation process by attempting to evaluate the contribution of the Spanish and the Portuguese to the European scientific tradition (Bleichmar et al. 2009) and to trace the different ways this knowledge was gained. Such studies will help us reconsider our understanding of European and non-European economies of science; they will help in understanding how these scientific cultures merged and what role they played in the colonial situation at the intersection of non-human processes and human action.

Previous studies have focused repeatedly on Portuguese or Spanish colonial spaces as if these were well-defined entities, dependent on their so-called mother countries. Whether the Spanish viceroyalties of New Spain or Peru, or the Portuguese *capitanias* in Brazil, or the Portuguese State of India (*Estado da Índia*), administratively and militarily these spaces were considered territories submitted to the Crowns in Madrid and Lisbon. The *Estado da Índia*, for instance, is considered a role model for its administrative innovativeness and organization, and anticipated many of the absolutist reforms of royal powers in eighteenth-century Europe (Newitt 2005, 70). Nevertheless, the territory of the *Estado da Índia* changed continuously: it made several attempts at territorial expansion and its frontiers were constantly shifting. The internal cultural heterogeneity, including religion, was intended to be overcome by means of a Catholic mission. In this sense, mission enterprises helped establish social hierarchies, for example, by claiming the superiority of European priests over “native” clerics (Ballhatchet 1998; Boxer 1978; Wendt 2011a; Županov 2005). From this colonial perspective, empires and their colonies were considered to be rather homogeneously organized into quasi-nations, with only limited communication taking place across their borders.

Some of the research literature explores the multinational, multiethnic and multilingual character of the Spanish and Portuguese Empires. Living alongside the conquered in the colonial territories were also others who came from other regions belonging to foreign powers. Paulo Jorge de Sousa Pinto, for instance, describes the Chinese populations in different Portuguese, Spanish and Dutch colonial towns (Pinto 2013, 91–108). The multiethnic environments in towns of the Portuguese overseas dominions are studied in a volume edited by Liam Matthew Brockey (2008), *Portuguese Colonial Cities in the Early Modern World*. According to João Fragoso:

This statement provides such mercantile circuits both a specific and a structural dimension because it guaranteed the survival and dynamics of this ultramarine empire, which was fashioned by social and economic diversity. (Fragoso and Silva Gouvêa 2014, 26)

Regarding the contributions to the Spanish Empire made by the many nations residing in different “Spanish” countries, Henry Kamen, for instance, made a step towards opening the Spanish colonial space: Castilians, Catalans, Italians from northern and southern regions, Flemish, Germans, all of the Indigenous¹ groups from the Americas and the Asian territories, the Chinese, as well as the different African groups all suffered the deracination of slavery and came together in this imperial space (Kamen 2002). John H. Elliott chose an extensive comparative approach between the British and the Spanish Empires, making fragmentation processes and transcolonial communication visible:

The comparison, therefore, it’s not between two self-contained cultural worlds, but between cultural worlds that were well aware of each other’s presence, and were not above borrowing each other’s ideas when this suited their needs. (Elliott 2007, xvii)

The relation between colonial empires and some colonized regions is one factor that enriches how we consider colonial structures. Another is thinking about a colonial territory as being comprised of many different regions, with several centers of knowledge production and diffusion, all of them specialized in one or several fields of knowledge and forms of knowledge organization. Instead of a uniform colonial organization, the structure of the Iberian empires is to be considered rather *multicentric* (Gruzinski 2004), where several colonial metropolises under Spanish or Portuguese domination worked as hubs of political and economic processes and were the central points of knowledge exchange and formation. The role of Goa, Mexico, Lima, Havana, the Canaries, Manila or Ceuta

¹I have chosen to capitalize the term *Indigenous* to underline the equality with other ethnical or national designations.

(among many others) in a network of knowledge transfer within the limits of the Iberian dominations, is therefore one aspect dealt with by the contributions of this volume.

A second aspect of this publication is the transfer of knowledge between different colonial spaces: knowledge could diffuse or be transferred from Goa to Manila, from Paris to Mexico, from London to Havana, from Bahia to Seville, depicting wide spreading and loosely interconnected networks of knowledge transfer. Iberian colonialisms² are often characterized by multi-local organizations with limited capacities to create stable border regimes. Movements of knowledge could be seen to be transcolonial because they took place in a global colonial context and transgressed the limits established by colonial regimes.³

The knowledge that circulated between the continents very often comprised subjects that in this period were part of the tradition of natural history. A third perspective, which will be developed in the final chapter of this volume, will thus focus on the issue of how European sciences, working on materials communicated from the colonies, began to classify non-European nature. In this long-lasting process, many actors pursued the goal of rendering this nature exploitable to European commercial and industrial means and thus contributed to increase the human imprint in ecosystems and geology. This process of the last 200 years is described by the term “Anthropocene.” This volume intends to use this term in a transformed modus, in order to make processes of knowledge circulation and production of the sixteenth to the early nineteenth centuries more understandable.

The Structure of the Volume

The present volume considers the processes of knowledge exchange and knowledge formation that first occurred inside one of the Iberian colonial empires. With one exception, the contributions are concerned with knowledge in the non-European parts of the Spanish and Portuguese Empires. The term “colonial” in the title is therefore more than simply a territorial and political designation. Colonial also indicates a state of mind (Gruzinski 2002), practices of trade, production of goods, functioning of institutions, diffusion of religions and, last but not least, the production and dissemination of knowledge (Cañizares-Esguerra 2005). We consider the “colonial situation” (Balandier 1963) to have given a special context for the production, diffusion and use of knowledge. The term “Iberian,” as used

²It is obviously important to use the plural here because we consider Portuguese and Spanish colonial dominions to differ in their organization and in the contexts of spaces and periods.

³Cf. Wendt (2011b). One example of transgression is the role of Portuguese so-called New Christians trading between the Spanish territories of Peru and the Philippines, as was emphasized by Sanjay Subrahmanyam (2012, 127).

in the title, will be used repeatedly in this introduction, whereby “Iberian” is used as a mere geographical designation for the Iberian Peninsula with its heterogeneous political and linguistic as well as religious and cultural structure. For the period from the sixteenth to the nineteenth centuries, the two monarchies (that are considered to be historically linked to the currently existing states) had stabilized their domination over earlier and competing reigns of the Iberian Peninsula. Incidentally, the Portuguese and the Spanish Crowns became briefly unified from 1580 to 1640, but even during this short period, their colonial policies differed greatly.⁴ The use of the term Iberia is by no means an attempt to unify the two Crowns or the territories they dominated in the non-European world. Rather, its use should reflect their differences, as would be the case for any other commonly used term.

The processes of knowledge exchange and knowledge formation dealt with in this volume involve the communications between the so-called metropolis and the colonies, as well as within the colonies themselves between the various groups of the colonies’ population. Communication of knowledge inside these colonial spaces were complicated by the great distances that separated the communication partners. Furthermore, communication, dissemination and diffusion of knowledge were never limited by colonial borders but stood in a transcolonial network of knowledge exchange. Therefore, the formation and generation of knowledge in the Iberian colonial world is intrinsically tied to similar processes in other parts of the world, leading to the epistemological situation of global entanglement whereby we now deal with the consequences of actions taken centuries ago or in distant regions of the world.

This volume focuses on botanical and medicinal knowledge transfer and transmission processes. It also provides insights into a history of knowledge related to mining and reflects on the linguistic dimensions of processes of knowledge transfer. There is also a critical historiographic dimension in the contributions that provides new readings of well-known sources and a direct debate of the research literature. Regretfully, the volume does not include as many examples from the Portuguese colonial world, as it does from the Spanish. This shortfall is due to the unpredictability of the editorial process. Again, I would like to emphasize that important studies on knowledge and its transfer in the Portuguese Empire have been published elsewhere (Bleichmar et al. 2009).

In his contribution, José Pardo-Tomás combines different forms of how natural knowledge was transmitted in New Spain during the sixteenth century. He concentrates on written and pictorial testimonies dealing with issues that can be subsumed under natural history. Whether in paintings of the Augustinian convent of Malinalco, in the writings of the physician Francisco Hernández that were sent

⁴Cf. Subrahmanyam (2012), esp. the chapter “Between Land-bound and Sea-borne.”

to New Spain by the Spanish king or in writings representing a more local perspective on “nature,” such as those by Muñoz Camargo, Pardo-Tomás offers an insight into a corpus of knowledge that historiography used to split into almost unrelated fields of research.

The sphere of the Catholic religion and its institutions, such as missions, was an important space, where different kinds of knowledge could be communicated. Lars Kirkhusmo Pharo focuses on moral knowledge that missionaries disseminated when dealing with very European concepts, such as sin or penitence. He studies the difficulties of translating such concepts from Latin or Spanish into Nahuatl, Mixtec and Quechua. This contribution helps us understand how cautiously translingual transfers of knowledge should be investigated. Furthermore, it points to the intention of European actors, such as the missionaries, to incorporate and alter Indigenous linguistic systems in order to impose their own interpretations.

In her contribution, Sonja Brentjes focuses on the work by Garcia da Orta on Indian medicinal plants. She offers an alternative reading to a source that is often considered an example of cross-cultural transfer of knowledge. She combines a biographical approach to Orta with a critical analysis of the political situation in mid-sixteenth century Goa. Brentjes argues that the printed work of the *Coloquios* should be understood as a product of the highly diversified colonial situation in Goa, and thus reconsidered in this very context.

Emma Sallent deals with a transfer of knowledge between Europeans and Indians in her contribution on Francisco de Motolinia’s *Historia de los Indios*. Her main focus lays on the Franciscans, especially on Motolinia. Sallent argues that terms of natural history were part of a vast conversion movement. In her contribution, Sallent makes it obvious that social spheres, like the religious and the scientific spheres, should be considered as being entangled rather than separated from each other.

Timothy D. Walker gives a rich overview of the many treatises published in the Portuguese Empire dealing with medicinal plants. He argues that these publications helped disseminate Indigenous medical knowledge and practices from one part of the Portuguese dominions to other regions and even beyond the frontiers of the Lusophone world. Walker provides the reader with a comprehensive list of oeuvres published from the sixteenth to the eighteenth centuries, which also reveals the infrastructures and institutions that helped organize the transfer of knowledge.

The communication between often separated spheres of knowledge is also a subject in Angélica Morales Sarabia’s contribution. She provides us with an account that integrates contributions from Indigenous and Spanish actors to the development of knowledge in the field of medicine. From a gender studies per-

spective, Morales Sarabia asks which conditions were needed for certain types of knowledge to pass from a female to a male, as well as from an Indigenous to a Spanish sphere of knowledge. Although, she faces the problem of sources being silent about informants, Morales Sarabia depicts the process of how knowledge became stabilized and hierarchized in New Spain, starting in the sixteenth century and ending in the nineteenth.

Mauricio Sánchez Menchero studies the transfer of knowledge via books about tobacco from Spain to England in the sixteenth century. He presents the different local and transcolonial contexts between Seville, London, Paris and Anvers, in which knowledge about this plant and its uses evolved. Furthermore Sánchez Menchero shows how social and political questions were important for the way this knowledge was achieved and disseminated.

Nuria Valverde Pérez stresses her conviction that mining maps of New Spain make an important contribution to knowledge of the social, geological and juridical contexts. Thus, mining maps express strategies for risk management. They can be considered, nevertheless, as testimonies of communication between theoretical and practical knowledge, between different social spheres and between different approaches to the “right” way to depict mines and geological data.

The contribution from Helge Wendt shows how different actors in the late Spanish colonial empire organized the transcolonial transfer of knowledge. Actors in the different administrations, mining engineers and entrepreneurs all had different reasons for accumulating useful knowledge about coal mining, which was an emerging economic branch in Cuba. Between 1828 and 1854, coal mining in Cuba can serve as an example of the interplay of knowledge formation, economic expectations and social transformation.

The final contribution by Helge Wendt on the Iberian path to the Anthropocene attempts to draw similarities with what in recent years have been called alternative ways to modernity in colonial and global histories (Eisenstadt 2002; Randeira 1999). Furthermore, different forms of industrialization have been studied under the terms of proto-industrialization (Kriedte, Medick, and Schlumbohm 1981; Schlumbohm 1996; Ogilvie and Cerman 1996) and industrial revolution (Bayly 2004; Vries 1994; 2008). The chapter therefore intends to underline the fact that the colonial era, even before the accelerated industrial evolution in Europe, was an important factor in forging the epistemological basis of what would happen in Europe during the nineteenth and twentieth centuries. Just as there were many paths leading toward industrialization, there is certainly more than one path to the Anthropocene.

Topologies of Systematization

Local Conditions for Knowledge Production and Dissemination

Some conditions in the Iberian colonial world created a situation where natural history and natural philosophy became the main frameworks wherein knowledge was produced and disseminated (Pardo-Tomás 2002; Simões et.al. 1999). They are considered in the writings of imperial history as being in the service of the ideology of imperial centralization. Furthermore, natural history and philosophy were forms of knowledge formation that preceded the early nineteenth century's human geography and geology. Nevertheless, the relations between local knowledge and highly transformed translocal knowledge systems, often part of the metaphysical system of Spanish Roman Catholicism, were never organized in a purely bottom-up or upside-down manner. Parts and packages of knowledge moved steadily vertically between the different levels of knowledge, being integrated into different spaces of knowledge production and contexts of the practical and theoretical implementation of knowledge. So-called local knowledge was rapidly transferred into other local spaces and alocalized knowledge—at least in its rhetorical dimensions—used to be transferred to different local contexts.

Contemporaries, such as William Temple (1628–1699), already observed such transfers between systems of knowledge. He wrote in his essay *On Ancient and Modern Learning* (1690), as the soil and the climate influence a tree's growth, so knowledge depends on local conditions to arise and evolve.

May not the same have happened in the production, growth, and size of wit and genius in the world, or in some parts or ages of it, and from many more circumstances that contributed towards it, than what may concur to the stupendous growth of a tree or animal? May there not have been, in Greece or Italy of old, such prodigies of invention and learning in philosophy, mathematics, physic, oratory, poetry, that none has ever since approached them, as there were in painting, statuary, architecture? (Temple 1814, 463)

The rather organic image used by Temple, although it concentrates on the bottom-up movement, refers also to a kind of intersystemic transfer of knowledge, when he mentions the climate influencing the growth of the tree of knowledge. Temple's image might therefore be useful in exploring further evolution processes of systems of knowledge at the intersection of the local, the systematic and the intersystematic.

The impact of locality becomes visible when the circulation of knowledge is researched in relation to central institutions and decentralized contexts, between

different forms of systematized knowledge and between more local and more global forms of knowledge. There is no doubt that science came about in the form of the systematization of general knowledge. However, it was not clear in the beginning which type of systematization would become recognized as being scientific and which other and alternative forms of systematized knowledge would not. Thus, the process of “scientification” is a process of interlocal communication in the forms of cooperation and competition. Institutions worldwide communicated on the advantages or disadvantages of one or the other type of systematization. What in hindsight became labelled as “science” was born out of these interactive processes which aimed at the best description and penetration of natural phenomena.

We know today that the “local” is not a place that, in more or less remote times, was isolated from its geographic surroundings. We call local knowledge the knowledge that in a given social and geographical space and for a given time span emerges in consequence of previous and concurrent communication of knowledge with other “localities.” This is due to its problem solving capacity for the local community, or parts thereof (Renn 2012, 369). Local knowledge is therefore entangled with other local conditions and knowledge production. This interlocal entanglement of knowledge confronts different traditions of organizing and depicting knowledge. Furthermore, the knowledge that is useful in one community in a given situation can differ from that in another community.

The evolution of science is tied to political and economic factors as well as issues of practicality, and is characterized by intercultural and interlocal communications. Each of the complex systems defends its particular perspective of only one valid form of classification. Competing forms of systematization, which existed simultaneously in the Iberian and the outer-Iberian worlds, show the variety of ways to systematize the scientific knowledge that evolved during the interaction between different traditions and new evolving forms of scientific approaches and that were supported by different institutions.

In this way, histories of the evolution of scientific knowledge and the transfer of knowledge in the Iberian world may differ from those that, for example, evolved in the English, Dutch or German scientific worlds (Elena and Ordóñez 2000). At the same time, the “Iberian” systems of knowledge were in constant exchange and competition with non-Iberian systems of knowledge, as Mauricio Sánchez Menchero underlines in his contribution to this volume. The differences between scientific and social cultures are important to the historical actors in order to create spaces of identity and to the historians to create frameworks of narration. As a result, both the interactions within the colonial-imperial system of power and foreign systems of power, such as between the Spanish and the British, for instance, must be intensively analyzed. These interactions of colonial-imperial

nature can be completed by “autochthonous” interrelations, that is, between different Indigenous groups and of course, should also take into account those only partly related to systems of political organization.

The transfer of knowledge, information exchange and systematization that occur in these processes all functioned in different ways. One way was through espionage, where the ruler would want to obtain knowledge from other areas. Another way was through the communication and scientific interests of various individuals. The exchange of knowledge in fields of religion was also a common conduit for interlocal and global dissemination. Others channels involved contract research on “foreigners” (such as the voyage of Humboldt, for instance) and the exchange of scientific information within networks existing within colonial borders and between colonial territories.

Changes in the Conception of Knowledge

The Portuguese and Spanish imperial spaces also manifest various differences in how knowledge had been and could be transferred. Agency plays its important role, making transfer processes dependent on the persons involved. Aside from the question of the quality of knowledge transferred or of the process itself, the differences occur when a European or a Creole⁵ from America was involved, and if he or she was a member of one of the Indigenous groups—a Mestizo, an African, a Mulatto or a foreigner traveling and communicating inside the imperial spaces. Angélica Morales Sarabia gives a good example of dealing with knowledge about medicinal plants by taking into account the gender of the authors who communicated, of the informants and of the partners with whom she or he was engaged in this transfer of knowledge. Morales Sarabia also highlights the importance of studying what happened to knowledge once acquired—in which form it was published or otherwise diffused.

In this sense, the present volume shows examples of how important Indigenous actors were for the development of forms of knowledge that consist in the mixing of non-European and European bodies of knowledge. These comprise political, cultural and social knowledge, as well as knowledge about natural phenomena and objects. In particular, José Pardo-Tomás illustrates in his contribution the multilayered processes in the formation of so-called natural history in the Americas, including local practices, artistic representation and “scientific enterprises.” He focuses on the interplay between single persons (Europeans and Amerindians), the Spanish Crown and the places where knowledge was generated and how it was depicted.

⁵ *Creole* denotes people of Spanish-European origin born in the Americas.



Figure 1.1: This plate shows New World plants in order to make them understandable and comparable for a European audience. Clavijero *Storia antica del Messico* (1780). Biblioteca Nacional de España, GMM/3015.

In the Americas, bodies of knowledge stemming from Europe were adapted to American contexts. When erudite Creoles or Amerindians began to work with such systematizations of knowledge, as for instance, Francisco Xavier Clavijero's (1731–1787) application of the botanical system of Carl Linnaeus (1707–1778), they quickly reached the limits of these kinds of transferred systematizations (Lafuente and Valverde 2005). Alfred W. Crosby in his famous *Columbian Exchange* (1972, 2003) stresses the fact that the Aristotelian based system of knowledge, transformed by

Hippocrates, Galen, and Avicenna [who] occupied whole shelves of every good fifteenth-century library from Baghdad to Oxford to Timbuktu, but these three giants of medicine had not a word to say about syphilis. (Crosby 2003, 9)

Clavijero tried to work with the classification systems in botany proposed by Jacques-Christophe Valmot de Bomare (1731–1807), the Plynian (23–79) descriptions of plants and American knowledge including the works of Francisco Hernández (1514–1587).

Clavijero mentions some of the plants depicted in his texts and gives further descriptions of them. The *xiloxochitl* (Fig. 1.1, number 2) is a tree-flower that Clavijero describes as coming from a large tree whose leaves are similar to those of the maple (Clavijero 1780, 64–64). Clavijero does not refer to the traditional and religious use of the flowers (see 1993), but to a more commercial use of the tree's resin. This is the reason why he described the *xiloxochitl* before describing *copal*, the best known Mexican incense. The allusions to maple and to *copal* were intended to render this plant more understandable to Europeans. In describing and classifying Mexican plants in a manner that used the forms of Francisco Hernández or Carl Linnaeus, Clavijero's work was pioneering. Nevertheless, the erudite priest Francisco Clavijero, who also wrote about the histories of pre-Spanish and post-conquista New Spain and California and had written a biography on the Franciscan missionary Junípero Serra (1713–1784), underlined the limited use of those “imported” taxonomies:

The experts in Natural History would prefer that when speaking about the Reign of Plants, the plants of California should be classified following one of the systems invented by the modern naturalists; but nor are there so many vegetables in that peninsula that their number requires such an method, nor would the notions we have of them be sufficient; nevertheless, we will apply the same system we used in the *História de México* because this is the one most adapted to the knowledge of any kind of person. (Clavijero 1990, 17)

Clavijero gave priority to his own classification system and thus showed how actors could influence formation processes of knowledge by referring to some bodies of knowledge, adapting them, introducing new bodies of knowledge and elaborating their own categories and systematizations.

Objects and the Circulation of Knowledge

The object of knowledge is a factor that shapes the conditions of how knowledge can disseminate. The physical features of an object of knowledge shape the possibilities of exchange or diffusion. Some objects, such as plants, stone samples, living or embalmed animals, books and written testimonies could be displaced when political control and transportation facilities allowed for such a dislocation. Trees, large animals, landscapes and religious or social systems could only be transferred through sketches, paintings and descriptions. Dislocation and the transfer of representations of objects of knowledge altered what could be known about that object and relocated it into new contexts of knowledge.

In consequence, some objects were more commonly adapted than others. Both the possibility for translocation and an object's characteristics that define its possible uses explain the steps people took to share knowledge and to acquire and consume the object. Different bodies of knowledge were shaped and defined by rather local and natural conditions of biology, geology, mineralogy or meteorology. Compared to the laws of physics, which claim to be universally valid, other fields of knowledge depend much more on local contexts. These objects are in many cases part of knowledge economies, which do not extend the social space where they are used, consumed and experienced. The plants, climatic conditions and minerals had been part of Amerindian knowledge systems long before the Europeans arrived and began to describe them in the aftermath of their conquests.

Europeans often felt that a simple negation of these kinds of knowledge was impossible because they considered the local conditioning from nature and knowledge to be a helpful and necessary vehicle of knowledge transmission and therefore tended to include it in European systems of knowledge. The acknowledgement that there was no *terra nullius* led to alternative classification systems such as those of Francisco Hernández and Francisco Xavier Clavijero, which altered the European as much as the "American" systems they competed with.

The Scientific Divide

Centralized, interlocal, decentralized and transcolonial transfers of knowledge all developed in relation to one another, not separate from one another. Tak-

ing this approach to the Iberian knowledge space opens up new possibilities in dealing with historiographic traditions, which have perceived this Iberian global space of knowledge formation as a special, peculiar and somewhat odd structure (Cañizares-Esguerra 2009). This space of knowledge circulation has in the past often been declared as incommensurable with systems of knowledge that have evolved in Protestant and “enlightened” knowledge systems. These Protestant and enlightened knowledge systems claim to have developed without the help of Iberian “scholastic” and “late scholastic” knowledge production, for those, according to such scholars, would not have been able to add any quality results in the first place.

Pardo-Tomás underlines in his contribution to this volume that scholastic science was formed by the interplay of different forms of knowledge. In arguing this, a common understanding is challenged that relied on a model of missions and people sent out from the colonial center to regions under colonial control in order to accumulate and gain knowledge in specific fields such as demography, botany, linguistics, mineral wealth or history. These “scientific missions” were altered by unintended side effects, as knowledge was formed “during the task” as a result of interaction between the European “scientific” and “local” cultures of knowledge. To trace this kind of interaction, careful study has to be carried out, as Sonja Brentjes underlines in her contribution. For instance, the communication between a European author and his “Indigenous” informants or communication partners has to be reconsidered again and again. Brentjes studies the case of the Portuguese physician Garcia da Orta, who resided in Goa, his social relations and the threat of being interrogated by the Inquisition. These circumstances, Brentjes argues, might also have had an important influence on his research and shaped his work as much as all the “native” knowledge he crammed into his oeuvre.

Thus, even when the circulation of knowledge followed the paths imposed and implemented by the colonial-imperial organization, the bodies of knowledge exchanged by different actors certainly differed from the results primarily envisaged by the initiator of a scientific mission. When, for instance, the visitor Bartolomé de las Casas (1484–1566) was appointed to redact the first census of New Spain in 1552, the information gathered helped him to write his far-reaching report on the disastrous impact the Spanish colonial domination had had on the Indigenous population (Abril Castelló 1987).

In many historical works dealing with the development of knowledge in colonial contexts, a further gap can be perceived in the scholarly research—in addition to the scientific divide between enlightened and non-enlightened systems of knowledge, say, between northern Europe and the Iberian south—namely, the question of how scientific and useful so-called Indigenous knowledge can be related to European knowledge. Kapil Raj (2013) has pointed out that in order to

overcome the debates about the non-scientific character of non-European knowledge, one has to ascribe a form of scientificity to systems of knowledge that are based on “production of knowledge, practices, instruments, techniques, and services” (Raj 2013, 343). To this perspective on the context related production of knowledge for resolving practical problems, a second order perspective can be added that firstly takes into account the metaphysical framework of knowledge production (Agrawal 1995, 422–423) and secondly, the self-reflexivity of systems of knowledge:

Every human society deals with the generation, transmission and application of knowledge and has accordingly also developed meta-knowledge about these processes. This meta-knowledge may not necessarily become expressed in statements about knowledge but may also be implicitly represented by certain social practices, such as communal or hierarchically organized decision processes, the social organization of learning processes, or the ways in which knowledge is encoded in religious activities. In this way, second-order epistemic frameworks are generated and maintained that regulate the power typically coming with knowledge. (Renn 2012, 376)

As with religion, there might be similar expansive social and cultural systems that are able to assimilate new bodies of knowledge and at the same time impose their own systematized knowledge to foreign systems. It might also be that in a given historical circumstance, one system of knowledge, as it travelled with political or religious expansion, overpowered another. This suggests a kind of expropriation of bodies of knowledge and, in some situations, even the dissolution of a whole “Indigenous” social organization, but with some parts of the system surviving independently or in amalgamation with the colonial system of knowledge. This is one of the issues discussed by Lars Kirkhusmo Pharo. The understanding in intersemiotic communication found in missionaries’ writings about “sin” and other moral transgressions communicates systems of knowledge related both to the religious and the civil worlds. By pertaining to such complex epistemological communication systems, so-called neo-Indigenous knowledge could be re-established and recomposed in recent Indigenous movements. Kirkhusmo Pharo aims to find out what the colonial missionaries knew about the old Indigenous systems of knowledge, which often became unacknowledged parts of the colonial knowledge economy. Kirkhusmo Pharo states that some aspects of Indigenous knowledge were even adapted to the needs of the European forms of scientific language and systematization. Others were openly exhibited as being of “exotic” origin in order to increase the distance between colonialist and colonized cultures of knowledge.

Both “divides” expressed by some studies are to be challenged by radically changing the perspective—as there is no “world science” in an abstract meaning, scientific traditions and the contribution of local and regional economies of knowledge have to be re-evaluated. The divide between Iberian economies of knowledge and the more Protestant of Dutch, British or (partly) German traditions is challenged by different works: This unity of what has been called “European science” can be questioned, as Patiniotis and Gavroglu (2012) have shown. The importance of knowledge economies of the so-called European peripheries for the evolution of sciences in Europe has been underlined by Gavroglu et al. (2008). This group intends to show “the significance of the processes of appropriation of scientific ideas, practices and techniques through the multifarious (local) cultural processes, to bring to surface the specificities of local sites which have had a decisive role in knowledge production, and to underline the decisive active role of all those whose intellectual, professional and often political interventions shaped the processes of appropriation” (Gavroglu et al. 2008, 154). These points go further than simply studying contributions of “peripheral” knowledge systems to the alleged higher forms of sciences: they indicate the autonomous status of alternative and different knowledge economies that are worth studying. Later in this volume, the issue of the presently discussed concept of the Anthropocene will be examined. It is intended to use this concept to make it understandable how past cultures and economies of knowledge could be studied as alternative paths to the present state of the Anthropocene.

The knowledge concerning the religious sphere and the daily surveillance of personal comportment resulted from the translation of complex concepts from one economy of knowledge into another. This happened under conditions when both systems of knowledge communicated in the context of colonial asymmetry of power. This situation can be compared to cases presented in the present volume such as *Making of Natural History in New Spain*, studied by José Pardo-Tomás, as well as the evolution of the medicine and its forms of description and depiction, presented by Angélica Morales Sarabia. Due to different cultural, religious and political spheres, the people who were part of different knowledge systems were conditioned to deal with nature in different ways. The fact that these people had the possibility to move between these spheres enabled bodies of knowledge, which previously had scarce contact, to communicate.

In the colonial circulation of knowledge, these forms of mixing created new bodies of knowledge, with sometimes intended, but often unintended consequences. In addition to the above-mentioned point, transfer of knowledge also happened in forms that depended less on government funded research activities. The exchange of knowledge in a “rectangle” between European and

Indigenous systems of knowledge, as well as between different Indigenous actors and between European actors, led to a hybrid form of knowledge.

Imperial Infrastructure and the Circulation of Knowledge

The Iberian economies of knowledge—including the colonial ones—developed in multiple contexts of traditions and impulses from the outside. They were shaped by the infrastructures and geographical spaces in which they were rooted. The exchange of knowledge in the sixteenth century therefore differed from exchange in the nineteenth century: both the technical infrastructure of communication and the centers of knowledge both inside and outside of the Iberian empires had changed. The issues that were brought to light depended on the context of time and place. In the sixteenth century, the systematization of knowledge was often based on the religious and theological worldview imposed by the Catholic Church. In the nineteenth century, after a century of Spanish and Portuguese participation in and adaptation of knowledge from the Enlightenment, knowledge formation and the organization of knowledge in erudite circles, academies, specialized schools and universities depicted this trans-European tendency (Lafuente 2000; Sánchez Menchero 2012; Withers 2007).

On the one hand, the forms of gaining and organizing knowledge changed, as well as the issues it dealt with, yet on the other hand, the power structures remained rather stable, although their frontiers often shifted.

The internal organization of the European territories was a fairly stable and long-lasting construction, with the capitals in Madrid and Lisbon and the viceroyalties (not only) in the colonial domains, the *Capitanias* and *Audiencias*. As with governmental organization, the ecclesiastical infrastructure established in the colonies—bishoprics and parishes—were one branch of the religious institution. The other was formed by the religious orders, the Augustians, Dominicans, Franciscans and the Jesuits, to mention just a few of the orders that spread to the colonial territories and established a spatial organization of their own. The religious orders formed provinces and the different territories competed with other ecclesiastical territorial orders, such as bishoprics. All of them founded schools and colleges wherein young Creoles and sometimes Indigenous men were educated.

In the Spanish territories, several universities were founded during the sixteenth century (among others) in Santo Domingo (1538), Lima (1551), Mexico (1551), Bogotá (1580), Quito (1586) and Cebu (Philippines, 1595), which furthermore shaped the landscape of knowledge in the Iberian colonies. All of them were founded by religious orders and grew out of a conglomerate of colleges already established in the towns. Following the same pattern, throughout

the seventeenth century universities were founded in Manila (1611), Santiago (1621, Chile), Córdoba (1621, Argentina), Sucre (1621), Mérida (1624, Yucatan), Guatemala (1676) and Cuzco (1690)—to mention only a few. During the eighteenth century, new universities emerged in other capitals of viceroyalties such as Havana (1721), Popayán (1744) and Guadalajara (1791).⁶

All of the universities were meant to propagate the Catholic faith and to create an elite that was devoted to its interpretation in the colonies (Elliott 2007, 203–207). This religion-based circulation extended beyond the walls of the universities. In parishes, colleges, schools and the mission stations, the Catholic faith was propagated. But instead of this Spanish-Catholic faith being characterized as a homogenous system of beliefs, it should be understood as a system of divergent currents represented by the religious orders and multiplied by the countless “fields of praxis.” No universities were founded in the Portuguese Empire. The Jesuits, who were influential in the Portuguese universities (especially in Evora), established colleges (*colegios*) in all parts of the Portuguese Empire. Havighurst and Moreira (1969) report on a situation rather similar to the Spanish colonial context for the Portuguese colonies in Brazil: education was very much related to religion because of the Jesuit organization of schools and higher education. For the purpose of recruiting young men, the Portuguese Jesuits organized the exchange of pupils from European to colonial colleges. At the same time, in contrast to the Spanish, they denied access to the *Companhia de Jesus* to all non-Europeans (Wendt 2011b, 243–244). Later, other Catholic orders offered education and organized the formation of a so-called native clergy, which, even after colonial domination had ceased, gave the Portuguese a certain degree of influence (Wendt 2011b, 263–264).

The religious sphere of knowledge circulation was highly heterogeneous and open to adapt to local conditions as well as to adopt influences from “abroad.” This “abroad” is defined as being non-Catholic religious spheres, as the pre-Columbian religious systems were still predominant in many parts of the Spanish and Portuguese empires.⁷ The issues of knowledge circulating in this religious sphere were comprised of theological issues and included and contributed to bodies of knowledge of natural philosophy and natural history such as botany, biology, geography and geology.

Knowledge circulated between local systems of knowledge, often transmitted by priests, missionaries, public servants or merchants. In addition, trained scientists, physicians and teachers diffused knowledge and contributed to the interlocal communication of knowledge. Timothy D. Walker gives an overview

⁶For the foundation of universities in the Spanish colonial territories during the Enlightenment, cf. Soto Arango (1995).

⁷See chapter 3 of this volume by Kirkhusmo Pharo.

of Portuguese botanical manuscripts that disseminated medical knowledge from the sixteenth to the eighteenth centuries. This medical knowledge, comprised of “Indigenous” bodies of knowledge that were integrated into a European Galenic system of medicine, circulated rather freely among people that held the same interest: to increase the possibilities of healing. Knowledge was also communicated in a more hierarchical manner, although the hierarchy itself was not necessarily intended to diffuse knowledge. This communication of knowledge from the bottom to the “imperial top” could occur through direct contact, but mostly depended on mediators and translational steps. This “communication chain” happened to be more or less public; secrecy in the transmission of knowledge was part of the formation process of knowledge in the Iberian empires. Consequently, much of the knowledge gained in the Americas, Africa, India and other parts of South Asia were never published and remained under lock and key in libraries, archives and private personal collections, ecclesiastical institutions or governmental establishments. For instance, the works of the Franciscan Bernardino de Sahagún (1499–1590) and of Guaman Poma de Ayala (1550–1616) were published only in the late eighteenth and nineteenth century. The knowledge transmitted by both authors remained confidential and was circulated within a very limited group of people.

The existence of tacit, unpublished or public knowledge that is particular to the Iberian colonial context does not influence the fact that knowledge was indeed produced, even if it circulated in restricted forms. The above-mentioned colonial infrastructure of political, religious and economic organizations that was implemented improved and enforced, willingly or involuntarily, the circulation of knowledge. Between the different local institutions of the widespread organizational units, knowledge formed in one local context and, depending on local contexts of competition, could gain an interlocal and supralocal impact. This impact depended on the comparability or even reproducibility of similar conditions in other places. Another factor that facilitated knowledge transfer was the direct or mediated communication between different institutions or actors belonging to the same institutional organization. Nevertheless, communication of knowledge did not end at a colonial border, as the communication lines established in the colonial period were part of intercolonial and transcolonial circulation; despite colonial jealousies and official restrictions, commercial exchanges trespassed borders. Furthermore, political communication also reached foreign countries and “public officers” used to look for useful knowledge beyond their immediate surroundings, both in times of peace and of war.

These exchanges occurred in many social sectors comprising those that are less directly related to the sciences and education. This is the case for political organization, trade and proto-industrial production processes. The Dutch

techniques of cultivating and processing sugar, for instance, came to the Spanish West Indies because of espionage, Spanish aggression against Dutch ships and the commercial—often black market—contacts between Spanish and Dutch merchants. Under these conditions, new hubs of knowledge could arise. Some of them were only of brief importance (at least as hubs of knowledge): during this Dutch-Spanish exchange of knowledge about sugar, for instance, Curaçao was an important center of knowledge exchange that lost this role when Spanish producers of sugar became as successful in sugar production as their Dutch competitors (Galloway 1989, 48–83).

In many parts of Europe during the late seventeenth and eighteenth centuries, the intellectual, economic and political movements of the Enlightenment began to emerge. These movements influenced the Iberian countries and scientific communities, who developed conventional forms of enlightened politics, economics, science and institutions. Subsequently, the reformations of political organization, economic politics and education in Portugal and Spain during the enlightened decades of the second half of the eighteenth century show how different spheres of knowledge could evolve in the empires, while expressing a certain incommensurability with the religious, Catholic sphere. It was during the time of the transimperial merging of knowledge, when intellectuals and their writings circulated throughout the European continent and reached to the Americas and the colonized Asian territories that “enlightened” institutions of specialized schools and academies were inaugurated (Simões, Carneiro, and Diogo 1999; Camprubí 2009).

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Chapter 2

Making Natural History in New Spain, 1525–1590

José Pardo-Tomás

Introduction



Figure 2.1: “Paradise Garden,” mural in the Augustine convent at Malinalco, Mexico (Mexico). Photographed by the author.

Ever since the discovery of the murals of the Augustinian convent of Malinalco in the middle of the 1960s, it has been clear that the convent walls speak to us about the “invention of New Spain” by the native communities who had survived the demographic catastrophe and by the friars who were trying to convert them (Estrada de Gerlero 1989, 63–112).

Malinalco is not the only Augustinian convent in New Spain with such impressive murals. In an illuminating article by Antonio Rubial (2008, 85–105) published a synthesis of the analysis of a dozen murals that have been preserved today in the Augustinian convents of New Spain.¹ All of them date back to the 1570s and 1580s. Rubial explained that they are idealized representations of the Thebaid, the name given to the desert region in the south of Egypt, which formed a spiritual retreat for St. Anthony the Abbot and countless Christian hermits from the third century onwards. It was frequently represented in Europe during the Middle Ages and Renaissance. This motif was particularly favored by the Augustinian order, though it was not without its internal tensions (Gutiérrez 1978; Rubial 1995, 355–383).

The wall paintings of the Thebaid in New Spain reconciled an apparent paradox within the marks of identity of the Augustinian order: the enclosed cloisters, location of community life and the garden as *locus amoenus*, were filled with representations of the open and solitary desert of the hermits, seen as a *sacred wood* (a medieval *topos* explored some time ago by Goff (1985, 59–75)). The idea of a closed garden as an earthly paradise that is so prevalent in the Spanish metaphysics of the Counter-Reformation, as Fernando R. de la Flor has pointed out,² here undergoes its colonial translation. It even became a commonplace in the colonization of the New World by both Catholics and Puritans, as Jorge Cañizares has emphasized (Cañizares-Esguerra 2006, 141–175). In spite of the constant elements in these representations—animals, plants, crags, friars, angels and demons—there is great diversity in the compositional schemes and in the styles of execution of the murals. This was due to the lack of a clear model of inspiration such as European engraving supplied by the friars to the groups of *tlacuiloque* (native painters) who executed the murals.

Malinalco undoubtedly represents an artistic pinnacle within this panorama, but it also forms an exceptional example as regards the process of cultural hybridization involving the first generations of *Indios*, Spaniards and Creoles in Mexico.³ The paradise of Malinalco was intended to convey the promise of salvation for the native population and for its converters to Christianity, the Augustinians. This paradisiacal setting is covered with representations of emblems, which are inspired by European-Christian culture, filled with references to the Greco-Roman world, and by Mesoamerican myths connected with virtue, strength or the identifying mythology of the *altepletl* (region) of Malinalco. On the other hand, dozens of species of plants and animals have been identified in the murals of Mali-

¹ See also Rubial (2010).

² Quoted by Chaparro Gómez (2002, 127). See also de la Flor (1999).

³ For a discussion on the concept of hybridism in the field of artistic colonial works in Latin America, see Dean and Leibsohn (2003, 5–35).

nalco, first by Favrot-Peterson (1987, 25–38; 1993), and later by Carmen Zepeda and Laura White (2005 and 2008, 173–199). More than half of these were native to the Mexican highlands, and ninety percent of them had some useful properties for the native population and for the colonists.

So this Garden of Eden in the middle of the Mexican highlands was constructed by means of an exuberant representation of the local flora and fauna. It was the work of painters trained both in the traditions of their families and communities of origin and in the vocational school that the Augustinians ran in Tiripetío, which was a rival of the one the Franciscans had maintained right from the start in the middle of the conquered Tenochtitlan: the Colegio de San José de los Naturales (Kobayashi 1974; Osorio Romero 1990; Zepeda Rincón 1999, 51–62). So in a certain sense the walls of Malinalco contain a “natural history” of the Mexican highlands. They are the visual representation of that natural history, but one indissolubly linked with a textual representation arising from the exchanges between friars and *indios*—an oral circulation that has been lost for ever.

This obliges us to consider what it meant to practice natural history in Mexico by writing, on paper or on walls, during the first sixty or seventy years of the colony. By which channels, by which authors and in which styles was it done? To that end it is necessary to consider as sources not only texts, but also images and even objects, when it is possible to relate them to those practices. This strategy enables us to go beyond writing, traditionally subject as it is to certain descriptive and taxonomic techniques—what Giuseppe Olmi⁴ has called *nominare, figurare e descrivere*—which were applied to each specimen of the three realms of nature observed, collected or selected by the writer. It was a question of fitting the experience of contact with nature to that mental grid, as Michel Foucault (1996, 137–176) called it.

It also enables us to take the emphasis off the *Historia natural de la Nueva España* of Francisco Hernández compiled between 1570 and 1577. At this point, Hernández’s work seems to have finally caught the attention of a historiography that elaborated on the story of the history of science from a radically Eurocentric perspective. However, apart from other considerations, this focus has hidden a large part of the panorama of what we would like to present.

Although it can be dealt with only briefly here, it is more of a proposal for future investigations than a concluded project with precise and specific results. For present purposes we shall concentrate only on what was to become the first phase of the natural histories of New Spain, extending from the conquest to the last decade of the century, until the publication of the *Historia natural y moral* of José de Acosta in 1590 (Acosta 1590).

⁴Olmi (1980/1981, 99–120). See also Ogilvie (2006).

We have therefore proposed to locate and classify clues, allusions and documentation that will help us to understand the forms of practicing natural history in Mexico. After that material was collected, the following step was to put forward a classification of the material for analytical purposes. We have found it useful and illuminating to distinguish three paths or programs in the praxis of a natural history of New Spain *in situ*.

1. Practices instigated by the Crown, from the epistemic setting of the court, as Arndt Brendecke has called it.⁵
2. Local, more or less spontaneous practices, from an epistemic setting in New Spain which has the city of Mexico and its hinterland as its epicenter;
3. Practices relating to the spiritual conquest, in the hands of religious orders.

Practices Instigated by the Crown

These practices form part of the continued attempt by Charles I and Philip II to collect information about the vast new territories under their control. This involves the innovative and diverse development of empirical methods of obtaining and managing information to which Antonio Barrera has insistently returned and which has been exhaustively theorized by Arndt Brendecke in his *Imperium und Empirie* (Barrera-Osorio 2010, 129–148; 2006).⁶ There can be no doubt that the development of this process started a long time before Hernández's expedition took clear form during the period of Hernández's stay in New Spain (1571–1576), and continued after his departure.

We mention here only three examples produced before the conception of the Hernández expedition. The first is the so-called *Comisión para la información, que ha de aver el Licenciado Ponce de León: para saber el grandor de la nueva España y Provincias della, y de sus pueblos y del grandor y calidad de cada uno dellos* given to Juan Ponce de León in 1525 and again on 5 April 1528.⁷ The proposed method of collecting information is important for its novelty. The joint responsibility for the information rested with a team consisting of the *Audiencia*, the bishop and the generals of the religious orders, who were to consult with the people who had the most experience and training; the information had to be based on documentary material and the testimony of trustworthy Spanish and native witnesses who made their statements under oath; and the framework was provided

⁵Brendecke (2009); Spanish translation, Brendecke (2012, 123–154).

⁶See also Brendecke (2009).

⁷Ponce de León, "La comission para la informacion, que ha de auer el Licenciado Ponce de Leon: para saber el grandor de la nueva España; y Prouincias della, y de sus pueblos y del grandor y calidad de cada vno dellos. M.d.xxv. Años," published by Puga (1945, II, 15r–15v).

by a questionnaire intended to obtain a cosmographic and topographic description of the territory and an approximate census of its population and resources, in particular its mineral resources. The *Descripción de la Nueva España* was completed and dispatched to Madrid on 5 July 1532. It is regrettable that this very first general description of New Spain is known to us only through excerpts that Antonio de Herrera incorporated in the following century in his work published in Madrid in 1601 (Herrera y Tordesillas 1601–1615).

The second example prior to the Hernández expedition is the *Instrucción para hacer las descripciones* contained in the *cédula real* of 1533:

Our aim is to obtain full notice of things of this land and their qualities. Therefore I instruct you to establish a very long and particular report on the size of this land, be it in its length and its width; also of its limits that should be specified by its proper names and how they are confined and landmarked by them; also of the qualities and particularities you find in it, enumerating each village separately; furthermore, the settlements of people, which exist in it of the naturals, pointing out their rites and customs in particular [...] and which harbors and rivers they have, which buildings are constructed, and the animals and birds that are bred there, their quality; once this task is fulfilled and your names are signed, send it back to Us to Our *Consejo de las Indias*. And together with this named report you will send paintings, as close to reality as you can of all things mentioned and of everything that can be painted.⁸

The revealing excerpt contains an unusual feature: the request to accompany the responses with the graphic representation of all “that could be painted.”

The third example prior to Hernández’s expedition is the questionnaire of 1553. Arising from another royal edict, it contained seventeen questions and gave rise among other documents to the famous reply from the judge Alonso de Zorita, who named and described the flora and fauna of New Spain in chapters fifty-two to seventy of the first part of his *Memoriales* and in chapters nineteen to twenty-

⁸Cited in Bustamante (2000, 44). The Spanish original: “Porque queremos tener entera noticia de las cosas de essa tierra y calidades della, vos mando que [...] hagays hazer vna muy larga y particular relación de la grandeza de essa tierra, ansí de ancho como de largo; y de sus límites, poniéndolos muy especificadamente por sus nombres propios y cómo se confina y amojona por ellos; y ansí mismo de las calidades y estrañezas que en ella ay, particularizando las de cada pueblo por sí; y qué poblaciones de gentes ay en ella de los naturales, poniendo sus ritos y costumbres particularmente [...] y qué puertos y ríos tienen, y qué edificios ay hechos, y qué animales y aves se crían en ella, y de qué calidad son, y así hecha y firmada de vuestros nombres, la embiad ante nos al nuestro Consejo de las Indias. Y juntamente con la dicha relación nos lo embiareys pintado lo más acertadamente que ser pudiere de todo lo susodicho, lo que se pudiere pintar.”

four of the second part of the same work.⁹ The mobilization of information put into circulation on the basis of the 1553 questionnaire is inseparable from the report by the royal cosmographer Alonso de Santa Cruz, compiled in 1556.¹⁰

We cannot ignore the close initial link between the description or enumeration of the natural world of New Spain and the continuous attempt to rationalize the extraction of royal tribute from the colonial producers, nor the connection between this and the transformation of painting in the pre-Hispanic cultures into tributary codices already in the colonial era. The Hernández expedition marks the moment when an agent sent directly from the epistemic setting of the court elaborates his own program for the collection of information in situ. The support of the court for this elaboration assumed various forms during the six years that the Protomédico spent in the Indies.

A single example will suffice to show how the Spanish court continued to stimulate this task of systematically recording information even during Hernández's stay in New Spain: the instructions sent by Philip II to the Viceroy Martín Enríquez, dated 17 August 1572:

[...] afterwards, you will inform any person, be it secular or religious, who might have written or recompiled or who possesses any kind of histories, commentaries or reports of one of the discoveries, conquests, [...] and as well of religion, government, rites and customs that the Indians had and have; furthermore, of the description of the land, naturals and qualities of the things there; ordering to search for those or something similar in archives, offices and bureaus of the scribes and in other parts where they might be; and those that can be found originally, or as a copy, you issue an order to send it to Us at the first occasion of departure of the float or boats to these kingdom.¹¹

This implies, among other things, that Madrid was aware of the existence of individuals who had elaborated and processed this type of material.

⁹Reference to Alonso de Zorita and the 1553 cuestionario in Bustamante (2000, 55). See also Zorita (1999–2001).

¹⁰On the report of Alonso de Santa Cruz, see Portuondo (2009, 210–212).

¹¹Philip II's Instrucción to Viceroy Martín Enríquez was published by Nicolás León in Ximénez (1888, XXIX–XXX). The Spanish original: “[...] hagáis luego informar de cualquier persona, así legas como religiosas, que hubieren escrito o recopilado o tuvieren en su poder alguna historia, comentarios o relaciones de alguno de los descubrimientos, conquistas, [...] y asimismo de la religión, gobierno, ritos y costumbres que los indios han tenido y tienen, y de la descripción de la tierra, naturales y calidades de las cosas dél, haciendo asimismo buscar lo susodicho o algo del en los archivos, oficios y escritorios de los escribanos y otras partes a donde pueda estar, y lo que se hallase originalmente, si ser pudiere, y si no la copia dél, daréis orden como se nos envíe en la primera ocasión de flota o navíos que para estos reinos vengán.”

After the return of Hernández to Spain in 1577, several examples could be cited. We shall mention only two clear signs of the efforts on the part of the Crown to provide continuity to the project that Hernández had conducted for several years.

The first is represented by the tasks carried out by the cosmographer Francisco Domínguez, who arrived with Hernández but remained in Mexico after the departure of the Protomédico.¹² In response to a letter sent by him to Philip II dated 30 December 1581, the following proposal was made: “that His Majesty should charge the Viceroy Enríquez with sending back the description of New Spain that [Domínguez] has improved from Doctor Francisco Hernández.”¹³

The second example refers to Juan de Vides, who was appointed Protomédico by the council of the city of Mexico in 1581 and 1582, and proposed continuing the natural history of Hernández. His patron, the Viceroy Lorenzo Suárez de Mendoza, advocated this in a letter to Philip II of October 1581:

[...] in continuation, rendering service to Your Majesty, of the Historia that the protomedico Francisco Hernández has started following an order by Your Majesty of the qualities and characteristics of the plants of this land.¹⁴

The end of Suárez de Mendoza’s reign as viceroy in 1583 raises serious doubts as to whether this proposal was ever implemented, but its very existence clearly indicates a desire for continuity in the royal ambition of compiling a natural history of New Spain.

The most striking evidence of that desire for continuity, however, can be seen in the circulation of a questionnaire with fifty questions printed in 1577 and created by the *Cosmógrafo Mayor* Juan López de Velasco for the Council of the Indies. It derived from the program of reforms undertaken by Juan de Ovando and aimed at obtaining an *entera noticia* on the American territories. The replies from almost two-hundred localities in New Spain have been preserved. The collection is known under the name of *Relaciones Geográficas de Indias*. What interests us here is the enormous plurality of voices reflected in these documents and the existence of cases in which one of those voices went further in replying to certain questions with the clear ambition of producing a natural history.¹⁵

¹²On Francisco Domínguez, see Somolinos (1960, 252–258).

¹³Fernández Navarrete (1842, 379). The Spanish original: “que SM mande al Virrey Enríquez remita la descripción de Nueva España que [Domínguez] trabajó mejorando lo hecho por el Doctor Francisco Hernández.”

¹⁴Martínez Hernández (2011, 113–114). The Spanish original: “[...] proseguir, siendo vuestra Magestad servido, la Historia que el Prothomédico Francisco Hernández comenzó por mandado de vuestra Magestad de las virtudes y propiedades de las yerbas desta tierra.”

¹⁵On the *Relaciones*, see Pardo-Tomás (2014) and the bibliography mentioned there.

“Local” Practices

Here we must limit our remarks to a couple of examples to convey an idea of the variety of forms in which the authors of the *Relaciones* complied with the request for complete information about the animals, plants and minerals, as well as the climatological conditions, the quality of the air, water, soil and inhabitants of the locality themselves. This second way of practicing natural history is located in the (relative) margins of the colonial program imposed by the metropolis. These are practices that emerged in situ, often aimed at local audiences and in pursuit of certain objectives that can be understood only if one considers the existence of a colonial, basically Mexican epistemic setting right from the first decades of colonization. In spite of the lack of a systematic collection of material, which is still pending, a couple of individual cases will serve to document the existence of these practices in the city of Mexico and its environs.

The transposition of the manner of conducting Plinian natural history to the Indies and resulting in *mestizo* knowledge is revealed very clearly in the production of the so-called *mestizo* or *ladino* chroniclers. Rolena Adorno and, more recently, Aguilar Moreno have drawn attention to them as “dual ethnographers,” without forgetting the idea that “the texts produced by those who wrote the history of their ethnic groups are revealing both for what they say and for what they suppress” (Adorno 1994, 383; Moreno 2002, 149–184). While they consider that “for these ladino historians, the re-evaluation of the past has a present-oriented objective” (Adorno 1994, 400), we should ask ourselves in the present case whether the natural histories inserted in their chronicles are, in that sense, a *re-evaluation* of the nature that belonged to them, or whether they were pursuing the maintenance of that possession as members of the *mestizo* elite in charge of their respective communities (Adorno 1994, 400).

In the heat of the mobilization produced by the 1577 questionnaire, these *mestizo* chroniclers produced two works that I would like to briefly present here. The first is the so-called *Relación de Tlaxcala* edited around 1584 by Diego Muñoz Camargo, son of a conquistador and a native noblewoman from Tlaxcala, who divided his time between Mexico City and Tlaxcala. In assuming the responsibility of replying to the questionnaire, he ended up editing a natural history of the region as a résumé of his extensive *Historia de Tlaxcala*, in which he defended the history of the Tlaxcaltecs, a loyal native group allied with the Spaniards against the Mexica during the conquest. Muñoz Camargo writes, among other things:

We will not treat on herbs and its medical roots, nor of other plants and flowers and its varieties and different colors, neither of plants that are called tuna de grana cochinilla nor of the ways the Indians

take advantage of them; I will not touch the quality and characteristic of birds and its colors, not of aromatic trees, because the doctor Juan Alonso de la Mota, dean of the Bishop-Cathedral of Michoacán, has a very comprehensive book of these things, astonishing and elegant, with the title *Floresta de virtudes* to which we refer.¹⁶

We know nothing more about this doctor Juan Alonso de la Mota, dean of the cathedral of the bishopric of Mechoacán, nor about his *Floresta de virtudes*. It may have been a work in an allegorical style, like so many others that were the fruit of the idea of colonization as spiritual gardening, as Jorge Cañizares has called it (Cañizares-Esguerra 2006, 178 and *passim*).

Once Muñoz Camargo had ruled out the possibility of repeating what Hernández and his friend the dean had written, he could not resist the temptation to venture on a natural history of his own, with aspects that were not to be found in Hernández or in the other contemporary Spanish sources. This is clear from the following excerpt on resins and aromatic herbs:

We will regard some astonishing things that we have seen [...] and of some trees that dribble odoriferous smells; that is the case of the tree called xochiocotzotl quahuil that in English [for Spanish] means the tree that is called “tree of odoriferous resin, smelling like the odor of a flower.” This is a very tall tree, similar to a pine and very straight; in its very height he forms a very curious crown, also its leaves are sparse like those of a laurel; wherever you find this tree it has a very fine odor. In order to extract the liquor you have to carve with a knife or an axe and [...] the tree is very appreciated and the old Indians estimated it a lot, because it was used by the lords [...].¹⁷

While Muñoz Camargo justified how he intended to deal with the information about the animals of the Tlaxcala region, this is what Juan Bautista Pomar wrote in

¹⁶Acuña (1985, 269–270). The Spanish original: “Menos trataremos de las yerbas y de sus raíces medicinales, ni de otras plantas y flores y de sus variedades y diversas colores, ni de la planta que llaman tuna de grana cochinilla y de la manera que benefician los naturales; ni menos, tocaré en la virtud y propiedad de las aves y sus colores, ni de los árboles aromáticos, porque el doctor Juan Alonso de la Mota, Deán de la catedral del obispado de Mechoacán, hace un libro muy copioso de estas cosas, curioso y elegantísimo, intitulado Floresta de virtudes, al cual nos remitimos.”

¹⁷Acuña (1985, 271). The Spanish original: “pasaremos sucintamente por algunas cosas curiosas que se nos ofrecieron [...] y de algunos árboles que destilan olores odoríferos, como es el árbol que llaman xochiocotzotl quahuil, que en nuestro romance quiere decir el árbol que llaman ‘árbol de resina odorífera, olorosa, como de olor de flor.’ Éste es un árbol muy alto, de hechura de pino muy derecho y, en lo más alto, hace una copa de sus hojas muy graciosa, aunque las hojas son menudas a manera de hojas de laurel, que adondequiera que está da muy suave olor. Y para sacar dél licor, le dan algunas cuchilladas con un cuchillo o hacha y [...] es árbol muypreciado, y los naturales antiguos lo estimaron mucho, porque usaban dello los señores [...].”

1582 about the medicinal herbs used by the people of Texcoco, the town situated on the northeastern shore of the swampy basin of Mexico:

The herbs used by the Indians for medical purposes, roots and plants, grains and seeds, are many; they are coming from this town and its surrounding, as well as they come from abroad; it was the doctor Francisco Hernández, *Protomedico* of his Majesty who has given a long and comprehensive report, written and painted in his books, relating its qualities and characteristics. There you can see its properties and effects properly of each thing; and therefore, this chapter treats of the most often used and of the effects they mostly have when applied in cures and as medicine, because to treat all of them needs necessarily a lot of time and a lot of writing.¹⁸

Pomar, who was a grandson of Nezahualcōyotl, the king of pre-Hispanic Texcoco, is a good representative of the *mestizo* nobility who, while allied with the Spaniards, tried to maintain its privileges and its power over the communities of native origin at all times. The examples of both Pomar and Muñoz Camargo serve to draw our attention to the uses and appropriations of these forms of doing natural history by members of the native population. The phenomenon has been studied accurately, though for a different context and period, by Kapil Raj (2007).

Let us now move on to the third form of implementing the praxis of a natural history of New Spain in situ.

¹⁸Acuña (1986, 109–111). The “Relación de Tezcoco” was dated to March 1582 by Juan Bautista de Pomar, but the original text was lost; we know the copy made by Fernando de Alva Ixtlilxóchitl around 1609. The Spanish original: “Las yerbas con que se curan los indios, raíces y plantas, granos y semillas, son muchas, así de las que se dan en esta ciudad y su comarca, como de las que de fuera della se traen, de las cuales el doctor Francisco Hernández Protomédico de su Majestad tomó muy larga y entera razón, que escribió y pintó en unos libros que de sus calidades y naturalezas hizo, en donde se verán sus propiedades y efectos muy en particular de cada cosa; y así se satisfará en este capítulo de lo que más generalmente usan y que más conocidos efectos hacen en sus curas y medicamentos, porque tratar de todas era menester hacer un proceso y escritura de mucho volumen.”

Practices in the Hands of the Religious Orders



Figure 2.2: “Dance of Death” mural in the Augustine convent at Huatlatlauca, Puebla (Mexico). Photographed by the author.

In their continuous attempts to convert the population to Christianity, the religious orders deployed the practice of natural history as an instrument for that conversion, but also for the training and development of the missionaries in the territory. We saw how the Augustinians put into practice a visual program of representing the natural world of New Spain, both in Malinalco and in the many other Thebaidas painted on the walls of their convents. In so doing, they attempted to articulate the struggle for the conversion of the *indios* with the promise of the salvation of their souls in a paradise on a par with the exuberant nature of the New World. That nature also included a description and a moral and social taxonomy of the heterogeneous population of New Spain. This can be seen very clearly, for example, in the mural of Huatlatlauca with the social groups portrayed in the “Dance of Death.”¹⁹ This seems an obvious and convincing demonstration of the nuclear *mestizaje* characterizing that “invention of New Spain” which under-

¹⁹On Huatlatlauca and the “Dance of Death,” see Rosquillas (2006, 12–24).

lies many visual and textual documents of the first generations. The Huatlatlauca mural shows the representation of the Spanish authorities and of the religious hierarchies, but also a strange assembly of male and female elite members of the community. As for natural history, the Thebaid and the Garden of Eden reappear in the other murals of the Huatlatlauca convent. So in a certain sense the walls of the Augustinian convents were already the site where a “natural and moral history of the Indies” was being written years before the appearance of the book of this title by the Jesuit José de Acosta in 1590.

As for the Franciscan order, it was the first to arrive in New Spain and the most active in deploying those resources in the course of the first sixty or seventy years of “the spiritual conquest of Mexico,” as Robert Ricard aptly called it.²⁰ There are probably many examples of this. This is not the place to dwell on the extremely interesting natural history that Fray Diego de Landa includes in his *Relación de las cosas de Yucatán*, written around 1566 during his stay in Spain, for the geographical and cultural distance of Mayan Yucatán would take us too far from the central Mexican area with which we are concerned here.²¹ In a previous article I focused on Fray Bernardino de Sahagún and the setting that is essential for an understanding of his *Historia general*, namely, Tlatelolco. All the same, I would like to say something about the style and forms of practicing natural history in Tlatelolco and to comment on some of its architecture that I only mentioned in passing in that article (Pardo-Tomás 2013, 40 note 3).

I am referring to the decoration with murals of the *Caja de Agua* created at a very early date by the *tlacuiloque* of Tlatelolco under the supervision of the Franciscans of the monastery of Santiago. Guilliem Arroyo, the archaeologist who studied these paintings, discovered in 2002, has identified ten representations of human beings with almost thirty hunting, fishing and collecting implements, some thirty animals and an equal number of plants, as well as the nine sections of the aquatic littoral with their corresponding watermills (Arroyo 2009, 15–32; Guilliem Arroyo 2013, 19–38). In a certain sense, the reservoir of Tlatelolco is another painted natural history, in particular an eloquent representation of the lakeside world surrounding the twin cities Mexico-Tenochtitlan and Mexico-Tlatelolco.

²⁰Ricard (1986), French original edition, 1933. See also Prodi (1979); more recently, Prospero (1999, 267–293); Cantú (2007); Broggio (2013, 441–447).

²¹Landa (2002), edited by Miguel Rivera Dorado.



Figure 2.3: “Box of water” [reservoir], in the Franciscan convent at Tlatelolco, DF (Mexico). Photographed by the author.



Figure 2.4: *Libellus de medicinalibus Indorum herbis*, ff. 8v–9r, manuscript made in 1552, published in Mexico by the Instituto Mexicano del Seguro Social, 1992. Author’s copy.

de las arañas



Figure 2.5: “On the Spiders,” in Bernardino de Sahagún, *Florentine Codex*, manuscript made c. 1577, published in Mexico by Secretaría de Gobernación, 1979. Author’s copy.

The process of hybridization of the *indios* who studied, wrote, read and painted in Tlatelolco reflects their dynamic nature and the richness and plurality of their practices. In this respect, María José Afanador (2011, 36) has emphasized their ability to “name nature in Nahuatl while complying with European standards.” That is what the painters of the reservoir achieved in 1530s, and Juan Badiano and Martín de la Cruz in the *Libellus* in 1552,²² or the informants and painters of Sahagún’s *Historia general de las cosas de Nueva España* in the 1560s and 1570s.²³

James Lockhart (1992) has pointed out how the adaptation of the *indios* to the writing techniques brought by the Spaniards enabled them to ensure the survival of Nahua culture and the persistence of their social and cultural organization. Gruzinski (1988, 86), in turn, has declared that “the *indios* of the Colegio de Santa Cruz in Tlatelolco gave the impression of being privileged witnesses who tried to master both cultural spaces between 1550 and 1580.”

What we would like to stress here is that this whole process of hybridization was compatible—albeit not without tensions or contradictions—with the missionary task of the Franciscans during the first half century of the conversion campaign. The natural histories that emerged from the action of various agents, with all the ambiguities they implied, were a contribution of the first order to the nascent culture of New Spain.

Perhaps the picture changes when it comes to translating—translating and transferring—the natural histories of New Spain to European audiences. To illustrate some of the problems involved, without departing from the world of the Franciscans, I would like to touch briefly on the *Rhetorica christiana* by Fray Diego Valadés, published in Perugia in 1579 (Valadés 1579).

Valadés was a Franciscan who had lived in New Spain since childhood and devoted twenty years of his life to missionary activities among the native population, returned to Spain in 1571 at practically the same moment when Francisco Hernández was disembarking in Veracruz. Valadés traveled on from Madrid to Rome in 1575. With this distance from the policy of Philip II, he placed himself at the service of the Pope and of the Roman strategy to secure a larger share of the missionary activities in America. This context of tensions between the policies of Rome and Madrid with regard to the organization of the Catholic mission in the Indies is essential for understanding the ultimate intentions of a work of the complexity of *Rhetorica christiana*.²⁴ This is not the place to go into this in more detail, but it is relevant to mention the work of Valadés here to show how

²²I used the edition Cruz (1991). On the *Libellus*, see Pardo-Tomás (2013, 28–32); see also Gimmel (2008, 169–182) and José Afanador (2011).

²³On Sahagún, see Pardo-Tomás (2013, 32–37) and the bibliography cited there.

²⁴On Valadés and his *Rethorica*, see Bolzoni (2008, 147–141); Báez (2005); and Chaparro Gómez (1996–2003, 403–419).

the relation between non-European natural history and the missionary program assumes plural forms of expression among the Franciscans, depending on a variety of factors including the complex intricacies of the relations within the triangle Madrid-Rome-Mexico.



Figure 2.6: “God the creator, redeemer and rewarder,” in Valadés (1579, 222).
Reproduced courtesy of Biblioteca de Catalunya, Barcelona (Spain).

Divergences of this type—as well as convergences, for they, too, exist—between the works of Sahagún and Valadés are evidence of this. Valadés’s work was in fact a manual of Christian rhetoric, but it was intended to give the missionaries in America a series of theoretical and practical skills that would help them in their mission. To illustrate the role of natural history in Valadés’s proposal, I shall present only two images and the accompanying texts. The first is the engraving entitled *God the creator, redeemer and rewarder* (Valadés 1579, 222).

In this interesting and original composition, the various stages of the creation of the universe as recounted in the Bible are expounded, from the angels, humans and various animals to the vegetable world. Here Valadés included animals and plants endemic to Mexico, such as maize, the opuntia cactus, the pineapple and cacao. The upper part is dominated by the representation of the Holy Trinity, inspired, apparently, by Dürer. In the lower part Lucifer with his retinue of demons are in hell. And this is one of the passages where Valadés commented on the image:

In eorum exploratorum numero per Dei gratiam ego quoque fui nec possum quidquam de ea regione prædicare nisi videri mihi omnium quas solvidet maximam, quæ nec propter æstum nec frigus inhabitabilis sit multis camporum patientium æquoribus, fluminibus, et fontibus plena, quæ parvo labore et sumptu ad irriganda prata et agros deduci possunt atque ita melius triticum et mahiz ibi colligitur quam vel in Hispania vel in cæteris partibus novis orbis hactenus devictis. Quod videre est in hortis ab Hispanis conditis in ijs partibus apud Sacathecos, ubi ego in civitate Nominis Dei in valle Huadiana, quam excoluit bonus ille frater Petrus de Spinareda, et sanctus ille Frater Cindos tantæ magnitudinis cydonia, granata, persica, et cotonea, ut nisi hic adessent qui conspexerunt ipse vererer dicere. Sunt cydonia paria capitibus puerorum. Persica magnis aurentijs aequalia sunt, cæpæ amplitudine patellarum aliæ magnitudine aurantiorum. (Valadés 1579, 202–203)

The second engraving is entitled *Description of the sacrifices that the indios inhumanly perpetrated in the New World of the Indies, principally in Mexico* (Valadés 1579, 172).



Figure 2.7: “Description of the sacrifices that the indios inhumanly perpetrated in the New World of the Indies, principally in Mexico,” in Valadés, (1579, 172). Reproduced courtesy of Biblioteca de Catalunya, Barcelona (Spain).

It aims to visually facilitate the description of the pre-Hispanic world of Mexico. Among other things, Valadés includes various endemic trees and plants, each labeled with a more or less Latinized name, such as Maguei, Tuna, Pinna, Cacao, Cocusi, Guaiaba, etc.²⁵ The engraving is connected to a passage in which Valadés discusses the sacrifices and temples of the *indios*, describing the building materials, form and surroundings of those *cues* and adding:

Exornabantur eadem templa viridarijs, fontibus amenissimis, balneis calidis, aquis stagnatibus, et hortis viridissimis, flosculis et arboribus amœnis. Habent autem flores eximios odoratos et varios Semper autem in illis plantabant magno studio arbores vaide patulas et umbrosas, usque adeo, ut in unius umbra mille homines agere possint, eo modo, quo Indi sedent. Quamvis autem sterilis, et infrugifera sit ea arbor, est nihilominus in tanto pretio, ut in comparationibus a maiori plerunque ab ipsa collationem ducant. Vocant autem illam Indi ahuehuatl, Hispani arbor de parayso, mihi autem non eiusdem generis esse videtur. Toto anno virides manent, sunt platano persimiles, nec tamen plane eiusdem naturæ, ut in catalogo variarum rerum novi orbis explicaturi sumus. (Valadés 1579, 168)

Unfortunately, no trace appears to remain of that *catalogo variarum rerum novi orbis*, whose mention here at least serves to show once again how much this form of practicing natural history was connected with the missionary program of the Franciscans.

Conclusion

Our final consideration proposes an integration of the three forms of praxis of natural history in situ that we have presented here. Such an integration is only possible from two complementary perspectives.

On the one hand, starting from the space of elaboration of these natural histories—Mexico, the city and its hinterland—some questions still call for better answers than what have been offered so far. When did this practice of doing, painting or writing natural histories commence? Everything seems to indicate that the answer is from the start and in different ways, but there is a need to examine the material we have unearthed so far in greater depth. In which spaces in the city or valley of Mexico were those natural histories written, painted or collected? There is an urgent need to chart the details of such production. Who

²⁵This part of Valadés' iconography is clearly inspired by illustrations from Gerolamo Benzoni's. *La Historia del Mondo Nuovo* (Venice, 1572). I thank Peter Mason, who pointed out this connection.

were the informants, what were the sources of inspiration for the paintings, how were the animals, plants and minerals obtained for stockbreeding, cultivation, consumption and exchange?

On the other hand, there is a second perspective that is similarly geographically focused: we should not ignore the fact that the sights of an important part of the actors in Mexico are fixed on Madrid and Rome as well, and that vice versa Madrid and Rome are looking towards Mexico. It is essential to chart the circulation of these natural histories among the three corners of this triangle. For example, there is an evident connection in the group of natural histories produced through direct instigation of the Crown, but it is (or should be) also evident that the three corners are connected via the circulation of natural histories carried out by the friars. As for the natural histories that emerged in a more or less spontaneous way in situ in New Spain, we should explore their transatlantic circulation, even before the period in which some of them were taken up again by European authors as an “archaeological remnant” and sources of information for the natural histories of the Enlightenment, although they are distinct and distant from those that concern us here. It is necessary to evaluate the reality and scope of a certain autonomy of the colonial periphery, which could even generate “independent attitudes” prior to those that Daniela Bleichmar (2008, 228) has highlighted for the eighteenth century.

What seems clear as a starting point is that, behind the various ways of practicing natural history in the final decades of the sixteenth and the first decades of the seventeenth centuries, there exists a plurality of intellectual projects, convergent and connected.

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Chapter 3

Transfer of Moral Knowledge in Early Colonial Latin America

Lars Kirkhusmo Pharo

Transfer and Imposition of Moral Epistemology

The category “morality” refers to codes of conduct put forward by a society, community, institution or organization.¹ The epistemology of morality, that is, moral knowledge, is significant because it contributes to the conception, production and practice of other categories of knowledge not only of the social (human) but also the interrelated natural world.

Not long after their arrival in the Americas, missionaries endeavored to transfer and translate knowledge, in particular moral knowledge, into the languages of Indigenous peoples through Latin alphabetic script and various Indigenous pictorial-logographic systems. These scriptures could also be intersemiotic consisting of both the Latin alphabetic and Indigenous semiotic systems. In order to expound the (intended) transfer of moral epistemology in early colonial Latin America, I employ a methodology of analyzing moral “core concepts” and “key concepts,” which Christian missionaries endeavored to transmit to Indigenous peoples. The transfer of historical-epistemological concepts of the early colonial period in America can be examined by explicating translations. Executing a systematic and comprehensive methodology through the analysis of dictionaries, grammars, manuscripts and comparative (diachronic/synchronic) anthropology makes it possible to recognize linguistic categories and terminologies of the knowledge systems of both Indigenous American and European cultures.

In this essay, I explicate the epistemological transference and encounter in the early colonial period through a comparative analysis of translations of the moral philosophical-theological key concept “sin.” I employ examples from primarily Nahuatl (the lingua franca of the Aztec Empire) of central Mesoamerica, with examples from Mixtec and Yucatec Maya of southern Mesoamerica, as well as from Aymara and Quechua (Quechua was a lingua franca of the Inka Empire) of the Andean region of South America. In particular, as I will elaborate, it is undeniably remarkable that the early colonial missionaries applied various trans-

¹Cf. Gert (2011 [2002]).

lated concepts (nouns and verbs) for “sin,” later substituted by a unique noun, from the above-mentioned Indigenous languages correspondingly.²

The translated words for “sin” into categories of Indigenous American languages contain a wide range of connotations falling beyond Christian morals and ethics. These lack a Christian meaning of an exclusive individual or common inherited transgression or wrongdoing and a metaphysical (*post mortem*) consequence, that is, a transcendental and eschatological judgment. There are two types of “sin” in Christian doctrine: “original sin” (*peccatum originans*), which is “sin in principle” inherited from Adam and “actual sin,” which refers to moral failures committed by the individual human being (Burke 1961, 222). “Actual sin” comprises evil actions, deeds, thoughts and words of the individual. “Original sin,” the sin of Adam outlined in Genesis 3, belongs to the human race as a collective. Paul outlines a corporate or collective inherited sin in Rom. 5: 12–21. But the specific doctrine of original sin was developed after Paul and is therefore absent in the New Testament (Lewis 1973, 158). Conversely, Indigenous moral philosophies are principally concerned with transgression against the community and the natural world. I put forward the theory that the core concept in the missionaries’ translation of moral epistemology into Indigenous linguistic-philosophical categories is not, although it is a highly significant and interrelated key concept, “sin” but “salvation.”

There is a fundamentally different conceptualization of moral transgression between Indigenous non-soteriological and European-Christian soteriological knowledge systems. Moreover, the European-Christian missionary enterprise of moral conversion differs radically from the non-missionary Indigenous cultures. The European missionary linguists intended to impose new moral principles upon the original concepts taken from the Indigenous language in order to obtain conversion. It is therefore impossible to translate the Christian concept of “sin” without concurrently making a cognitive transformation, a moral epistemological conversion, of the Indigenous culture.

Ideologically related to European missionary dogma, early colonial period Eurocentric morality was imposed in America in what is known today as “The (Christian) Doctrine of Discovery.” This early colonial judicial doctrine, signifying European dominium of the natural and social world, is practiced in the legal systems of contemporary postcolonial national states in order to repudiate not only Indigenous autonomy and self-determination, but also moral identity and ethics. The heritage of colonial North Atlantic (i. e. European) epistemological obscurantism or unawareness, that is, anti-knowledge and disregard for Indige-

²For various concepts of “sin” in colonial Yucatec cf. Schrader-Kniffki and Yannakakis (2014) and Yannakakis (2014).

nous knowledge abilities and moral systems, is closely related to the issue of Indigenous self-determination.

Despite essential religious and philosophical differences, however, there are principal similarities between European-Christian and Indigenous moral epistemologies. Finally, I advocate that specific pre-European/pre-Christian concepts of “morality” exist in Nahuatl and in Quechua and Aymara—and probably in many other Indigenous American philosophic and religious vocabularies as well.

First, I will briefly explicate the different scriptural and semiotics sources on the encounter between Indigenous and European moral epistemology in early colonial Latin America.

European Missionary Linguists and Ethnographer Missionaries’ Records of Indigenous Moral Philosophy

From the beginning of the sixteenth century representatives of the Spanish monastic orders—the Franciscans, the Dominicans and the Augustinians, later followed by the Jesuits—began to create systematic descriptions of Latin America. In so doing, the various missionaries composed a quite extensive epistemological corpus outlining nature, geography, society, economy, beliefs, ritual practices, institutions, history and languages. Accordingly, between the sixteenth and eighteenth centuries numerous, more or less contemporary, non-doctrinal descriptions of Indigenous cultures were produced by the Spanish “ethnographer missionaries” (henceforth: EM) or “missionary linguists” (henceforth: ML).³

The missionaries were preoccupied with transmitting Christian moral philosophy to the Indigenous peoples. Spanish EMs and MLs translated doctrinal writings—that is, catechisms or “*doctrina*,” sermons or “*sermonario*,” manuals of confessions or “*confessionario*,” passages from the Bible, and other edifying scriptures—into Indigenous languages, particularly in the sixteenth and seventeenth centuries. Although written in an Indigenous language, these manuscripts reflect Christian theology and do not demonstrate ample knowledge of Indigenous linguistic-categories of moral philosophy.

An exceptional non-doctrinal source to Indigenous moral philosophy in an Indigenous language is Fray Bernardino de Sahagún’s⁴ bilingual (Nahuatl and Spanish) *Florentine Codex*⁵ or, *Historia General de las Cosas de Nueva España* (“A General History of the Things of New Spain”), copied in Mexico City

³The “ethnographer missionary” described the culture, religion and history, whereas the “missionary linguist” wrote dictionaries and/or grammars outlining the languages of Indigenous peoples.

⁴Cf. Nicholson (2001).

⁵The *Florentine Codex* is named after the manuscript’s (ms. 218–220, Col. Palatina) present residence at Biblioteca Medicea Laurenziana in Florence, Italy.

c. 1578–1580. The encyclopedia *Florentine Codex* is the most illustrious work written by an ethnographer missionary in the Americas. The Franciscan Sahagún (c. 1499–1589) arrived in Mexico in 1529, only eight years after the Spanish conquest of the Aztec Empire. He acted as a missionary while gathering data on the language, history, culture, philosophy and religion of the Nahuatl. Nahuatl (“intelligible,” “clear,” “audible”) refers to the Indigenous peoples of Mesoamerica speaking one of the related dialects of Nahuatl.⁶ So-called Classic Nahuatl,⁷ the language of the Aztec Empire,⁸ was a lingua franca in the post-classical and early colonial periods in Mesoamerica.⁹ Because the Aztecs had dominated a great part of Mesoamerica before the Spaniards arrived at the beginning of the sixteenth century,¹⁰ numerous written recordings outline Nahuatl culture in Central Mexico. Spanish civil and religious officials used Nahuatl as an administrative language in the early colonial period.¹¹ Sahagún recognized that he had to outline, within a historical and anthropological perspective, the ancient traditions in Nahuatl, in order to reveal customs that were potentially dangerous (“demonic” or “diabolical”) for the missionaries. The *Florentine Codex* constitutes an extraordinary book, not only because the data were collected and composed just after the Eu-

⁶Quite a few descendants of the Nahuatl, who once formed the Aztec Empire, still live in Mexico. The Nahuatl comprise c. 1.5–2 million people of Northern and Central Mexico who speak Nahuatl, which is more than any other family of Indigenous languages in contemporary Mexico. In addition, quite a few Nahuatl reside in the US as migrant workers, Sandstrom (2010, 23).

⁷Classical Nahuatl refers to the colonial Nahuatl dialect that is generally used in documents from Central Mexico, Dakin (2010).

⁸The Prussian scholar Alexander von Humboldt and the American historian William H. Prescott introduced the word “Aztec” to the Western public in the early nineteenth century. I apply the term “Aztec” instead of “Mexica” despite the fact that several scholars, since Robert Barlow in 1949, have pointed out that this designation is incorrect. The term “Aztec” derives from *aztecatl*, “person from Aztlán.” Aztlán, which can be paraphrased as “the white place” or “the place of the herons” in Nahuatl, was the designation for their mystic place of origin. The name “Mexica” was given to the Aztecs by their patron deity, Huitzilopochtli, during their migration from Aztlán. The Aztecs or Mexica were originally a Nahuatl-speaking nomadic tribe. They founded the city of Tenochtitlan, today’s Mexico City, which became the capital of their short-lived realm in the northern and central part of Mexico from 1345 AD to 1521 AD.

⁹Mesoamerica has been defined as a cultural-geographical region incorporating the north-western, central and southern Mexico, Guatemala, Belize, and the western part of Honduras and El Salvador. In this area peoples, like the Maya, Aztec, Olmec, Zapotec, Toltec, Tlapanec, Teotihuacano, Tarascos, Otomí, Mixtec etc., lived in sophisticated urban civilisations from c. 1000 BC to–1521 AD. ‘Mesoamerica’ was originally outlined as a cultural and geographical unity by Paul Kirchhoff in 1943, Kirchhoff (1943). Other definitions of this region have been suggested as well, cf. Carrasco (2001, ix, xiii).

¹⁰Three Franciscan missionaries from Flanders arrived in “New Spain” as early as 1523. But the first official missionaries were twelve Spanish Franciscans who came the following year, in 1524. The Dominicans and the Augustinians followed the Franciscans correspondingly in 1526 and in 1533. The Jesuits entered a bit later, in 1572.

¹¹Dakin (2010); Karttunen and Lockhart (1977); J. H. Hill and K. C. Hill (1986); Lockhart (1992). But cf. Schwaller (2012).

ropean conquest but most importantly because it is written in Nahuatl.¹² The *Florentine Codex* records various moral concepts in Nahuatl of a non-Christian European origin. Sahagún collaborated with Indigenous assistants and applied standardized questionnaires for interviews with Indigenous informants (López Austin 1974). Sahagún's assistants comprised a small group of converted trilingual (Nahuatl, Spanish and Latin) sons of the ancient Indigenous aristocracy educated at the Colegio de Santa Cruz, which was founded in 1536 in Tlatelolco, not far from Mexico City.¹³ Sahagún and his assistants conducted interviews with anonymous informants of the Nahua realm of Tepepolco (Hidalgo), Tlatelolco and Tenochtitlan of Central Mexico.

Apart from ML dictionaries and grammars (Sp. *Arte*) of Indigenous languages, the research of the EM Sahagún gives unique access to reconstructing moral-linguistic categories and philosophy of Indigenous peoples, not influenced by European Christianity.

Transfer of Moral Epistemology in (Inter) Semiotic Systems

Not long after the Spanish conquest the Franciscan EM Torbio de Benavente Motolinía relates that in the city Cholollan or Chollan in Puebla (Mexico) he asked the Nahua to confess their “sins” written in their own writing or semiotic system. He apparently received many of these “confessions” (Motolinía 1971; Boone 2000, 245). Both early colonial European and Indigenous peoples appropriated knowledge of each other's respective writing and semiotic systems. They also produced scriptures where both graphic methods were applied “in a intersemiotic manner,” that is, simultaneously. These various strategies of communication made it possible to convey or translate various ideas, concepts and practices.

In particular in Mesoamerica and the Andes of South America, where the European encountered numerous civilizations with refined semiotic and writing systems, missionaries constructed various intersemiotic (hybrid) pictorial-logographic catechisms and confessionals based upon Indigenous and European semiotic, symbolic and iconographic conventions. Both (converted) Indigenous peoples and missionaries produced these manuscripts. Indigenous pictographic-logographic systems, although with European conventions, were employed to convey Christian moral theology and practices. For instance, the Lord's Prayer is

¹²An earlier work than the *Florentine Codex* is *Primeros Memoriales* (a name given to it later by Francisco Paso y Troncoso). *Primeros Memoriales* is based upon interviews with Indigenous aristocrats (1558–1560) from Tepepolco, a city about 60 kilometers northwest of Mexico City, Sahagún (1997 [1560], 3–4).

¹³Sahagún names his four trilingual Nahua assistants as Antonio Valeriano from Azcapotzalco, Alonso Vegerano from Cuahuahtitlan, Pedro de San Buenaventura from Cuahuahtitlan and Martín Jacobita from Tlatelolc, Sahagún (1950–1982 [1565], 55).

depicted with the use of Nahua principles of logosyllabic writing in a seventeenth-century manuscript (Edgerton 2001, 28–30). Semiotically, this represents a “disjunction” where the viewer is encouraged to identify a Christian meaning in a non-Christian religious sign (Durston 2007, 63). The pictorial-logographic catechisms and confessionals could also be accompanied with glosses translated into an Indigenous language or Spanish in Latin script.¹⁴ It is important to emphasize that the (moral theological) context, semiotic code and language had to be known in order to interpret the meaning.

Pictorial-logographic catechisms, called Testerman manuscripts after the Franciscan Jacobo de Testera (1490?–1554), were made from the sixteenth century to the nineteenth century in Mesoamerica. Forty-two manuscripts are extant containing Roman Catholic doctrine including the Our Father, Hail Mary, Salve Regina, Apostles’ Creed, Ten Commandments, Seven Deadly Sins and Church sacraments. This manuscript tradition represents a hybrid (intersemiotic) combination of pre-Hispanic pictorial and European catechistical manuscript tradition (Leibsohn 2001, 214–215). Pictographic Roman Catholic catechisms were also produced for Quechua and Aymara speakers from the Lake Titicaca region of Bolivia and Peru in the Andes as late as in the nineteenth and early twentieth centuries (Mitchell and Jaye 2008, 265–267). Besides (intersemiotic) pictorial-logographic scripture there were also other Latin American semiotic systems applied by the Europeans in the early colonial period.

Khipu (dyed knotted strings), originally used by the Inka¹⁵ and other (earlier) linguistic cultures of the Andes in order to record and communicate a variety of information, were also employed by European missionaries (Urton 2009, 823–824, note 10). *Khipu* (pl. *khipukana*)—from Quechua or *chinu* from Aymara (pl. *chinunaka*), which both signify “knot”—constitute a complicated system. It represents a combination of dyed knotted strings in which apparently ply, form, structure, color, direction, placement and number are significant for communication (Hyland 2014; Urton 2002; 2008). Khipu contains interrelated accounts (narratives) and transference of quantitative (mathematical) information. This system—which may have a binary codified, mnemonic or phonetic (i. e. writing) principle—is, however, not satisfactorily deciphered.¹⁶

¹⁴Cf. Boone (1998, 2011); Glass (1975); Normann (1985); Resines (2007); Valenzuela (2003).

¹⁵The Inka ruled the largest known empire, c. 1430 AD–1532, in the Americas before the European invasion. They spoke a dialect of Quechua, which became a lingua franca within the multicultural and multilingual empire and after the Spanish conquest (early colonial period).

¹⁶Durston (2007); Salomon (2008, 300–301). Frank Salomon (2008, 286–287), cf. also Quilter and Urton (2002), has summarized three fundamental theoretical positions for the principle of Inka khipu formulated as: a Quechua syllabography or phonography; a semasiographic system; a neutral binary code.

Khipu were transcribed, translated and recorded in the early colonial period for administrative archives, but no extant example of a corresponding khipu transcription exists today.¹⁷ Together with Latin script and European numeracy the Spanish viceroyalty used khipu-masters (*khipukamayō*) in economic records (accounting and tribute census), demographic census, registries, in judicial and political affairs among the Quechua and Aymara speaking peoples from the 1570s. Accordingly, there was “a semiotic co-existence” of khipu together with Castilian and Latin literacy in the early colonial period. It was employed until the late eighteenth century in local (vernacular) Indigenous administration, even later in some places that recorded communal work and non-Christian rituals with “khipu-boards” (Salomon 2008, 286–287, 290–292, 297, 299–300).

Spanish Catholic missionaries of the sixteenth and seventeenth centuries applied khipu with the purpose of making confessionals and catechisms.¹⁸ The hybrid khipu-alphabetic objects known as “khipu boards” were developed by Spanish clerics. At the end of the sixteenth century, Mercedarians produced khipu-boards with alphabetic writing for evangelization. According to the Jesuit EM José de Acosta in 1590, confessional khipus (e. g. confessional manuals) recorded sins, in particular among women. Elders also employed khipu as catechisms. Lay specialists recorded confessions on khipus into the early seventeenth century and even in the twentieth century. The Roman Catholic calendar was even recorded on khipus according to the Mercedarian Martín de Murúa.¹⁹

The European missionary innovation of a novel semiotics signifies how Christian moral epistemology was transferred to the Indigenous target culture with the intention of redefining the semantics of the Indigenous language, graphic and symbolic system—thereby converting Indigenous moral knowledge and practices.

¹⁷Urton (2009, 823–824, note 10); cf. Pärssinen and Kiviharju (2004, 2010).

¹⁸Cf. Urton (2009, 824–827); Salomon (2008, 295–296); Harrison (1992, 1993, 1994, 2008).

¹⁹Acosta (1590); cf. Urton (2009, 824–827); Salomon (2008, 295–296); Harrison (1992, 1993, 176–178, 1994, 1995a, 1995b, 2002, 2008). The pictorial-logographic manuscripts and khipu may have been a *scriptura franca* able to communicate theology and moral epistemology into the various languages of the Andes, Kirkhusmo Pharo (Forthcoming(b)).

Missionary Translations of the Moral Concept of “Sin” into Indigenous Languages

“Sin” (Sp. “pecado”) comprises a highly complex multiple-reference conception, whose semantics depends upon the moral system in question.

The Mixtec, who refer to themselves and their territory “La Mixteca” as *Ñuu Savi*, *Ñuu Sau* or *Ñuu Dzavui*,²⁰ “people of the rain” or “the people belonging to the rain god,”²¹ are especially known for their impressive pictorial-logographic manuscripts (*ñii ñuhu*, “sacred skin”) from the post classic and early colonial period (c. 900AD—c. 1600).²² La Mixteca—which is comprised of three geographic zones: Mixteca Alta, Mixteca Baja and Mixteca de la Costa—was geographically fragmented, consisting of chiefdoms and city-states, with different dialects from the pre-colonial period.²³

“Sin” is recorded in Fray Francisco de Alvarado’s Catholic colonial Spanish-Mixtec dictionary with the entry *kuachi*.²⁴ The many glosses of *kuachi* (also spelled as *kuachi* or *kuachi*) in the entry comprise “guilt” (“*culpa*”), “crime” (“*crimen*”), “flaw” or “defect” (“*defecto*”) and “fault by guilt” (“*falta por culpa*”).²⁵ The Dominican Fray Francisco de Alvarado’s (1558–1603) collected and prepared the Spanish-Mixtec dictionary *Vocabulario en Lengua Mixteca* published in 1593. This dictionary does not contain one-to-one translations of words, but various long explanatory paraphrases creating inadequate conceptual translations. This lexicographic strategy is interesting and revealing because it suggests that Alvarado believed that many Spanish lexemes could not be translated into Mixtec. Moreover, Alfonso Caso has reconstructed from a grammar, *Arte en lengua Mixtec* published by the Dominican missionary Fray Antonio de los Reyes (?–1603) in 1593, a brief word list where Mixtec entries are translated into Spanish. We do not know much about Alvarado and Reyes other than they learned to speak Mixtec fluently and that they built their

²⁰There are different spellings according to the various dialects, Jansen and Pérez Jiménez (2003, 4). Cf. Jossierand (1983) about the various dialects of the Mixtec language.

²¹The term “Mixtec” derives from Nahuatl *Mixtecatl*, meaning “Cloud People.”

²²Today the Mixtec mainly reside, in more than sixty villages, in the Mexican states of Oaxaca, Puebla and Guerrero (the Mixteca homeland) but many have migrated to in particular Mexico City and the US. The statistical data are not certain but several hundred thousand people speak Mixtec (*Ñuu Sàu; Dzaha Dzavui*, “language of the rain”), cf. Caballero (2008, 391–392).

²³Jansen and Pérez Jiménez (2003, 5). Cf. Pérez Jiménez for references (2003, 5, note 1).

²⁴Pecado, *kuachi*, *dzica*, *yeca kuachi*, Alvarado (1962 [1593], 163). The use of the word *dzica*, according to Reyes (1976, 74), is distinctive of the Mixtec reverential language *iya*. This language was used in the rhetoric about divine beings or people (*iya*), Jansen and Pérez Jiménez (2009, 189–190).

²⁵Alvarado (1962 [1593], 54, 57, 59, 68, 109). In colonial Mixtec original sin is recorded as: “*pecado original: kuachi noho tutnu ñoho dziñe; pecado original: kuachi caa q cata cusì; pecado original: kuachi sa ndidzo sa tavui; pecado original: kuachi yehe dzeque yehe tnaa sa dzuchi yocacu*,” Alvarado (1962 [1593], 164v).

work upon earlier friars and cooperated with Mixtec informants and assistants (Jiménez Moreno 1962, 34–40).

The first known example of Mixtec-language alphabetic writing is, however, the *Doctrina Cristiana en lengua Misteca* by the fluent speaker Dominican, Fray Benito Hernández in 1567/1568, probably in collaboration with (converted) Mixtec aristocrats. The grammar and vocabulary of Reyes and Alvarado refer to the *Doctrina* of Hernández (Terraciano 2001, 7, 69–70). The same Mixtec word for “sin” (*kuachi*) is employed in the *Doctrina*²⁶ for: “evil life” (“*vida mala*”), “vice” (“*vicio*”), “guilt” (“*culpa*”), “falsehood” (“*falsedad*”), “fault” (“*falta*”) (Jansen and Pérez Jiménez 2009, 154). In addition, Fray Antonio de los Reyes defines *kuachi* as an “excuse” besides “sin” and “guilt.”²⁷ Mixtec is a tonal language where the meaning of the words changes depending on whether it is a high, medium or low tone. In the colonial dictionaries tone is not marked by separate entries. There is accordingly a semantic ambiguity with *kuachi* as well as with other Mixtec concepts. *Kuachi* was often modified by other words in order to convey a different meaning according to context. Kevin Terraciano has observed that this moral notion is applied in criminal records from the colonial period. “Crime” therefore probably represents the non-Christian/non-European ethical meaning of *kuachi*. For instance, Pedro de Caravantes from the pueblo Yanhuitlan of the Mixteca Alta applied the word *kuachi* to refer to his criminal act of murder according to a note from 1684. In addition, he employed *kuachi* “in reference to his *anima* (“soul”) and God. Thus, the instigator of the murder conveyed a Christian concept by extending the semantic range of a native-language word in conjunction with a basic loanword (Sp. *anima*)” (Terraciano 2001, 305).

In *The Slippery Earth. Nahuatl-Christian Moral Dialogue in Sixteenth-Century Mexico* (1989), Louise M. Burkhart analyzed the concept of “sin,” which was translated by Catholic colonial missionaries as *tla[h]tlacolli* into Nahuatl in the sixteenth century. In the colonial period, the Catholics translated original sin as *tlatlacolpeuhcayotl* “the beginning of sin” or “the sinful beginning,” *tlatlacolnelhuayotl*, “the origin of sin,” *achto tlatlacolli*, “first sin,” *huehuetlatlacoli*, “old sin.” The latter concept was employed according to Motolinía (1971, 369) to categorize a type of inherited slavery.²⁸ Burkhart (1989) explicates how the Spanish EM and ML translated and applied *tlatlacolli* in ethnographic and various doctrinal scriptures translated into Nahuatl in the sixteenth and seventeenth centuries. In his dictionary from the early colonial

²⁶The *Doctrina* was also translated from Mixtec to Chocholteco (Ngiwa), cf. van Doesburg and Swanton (2008).

²⁷*Kuachi*, culpa, pecado, excusa, Los Reyes (1976, 129).

²⁸Burkhart (1989, 114). *Tlatlacolpeualiztli*, pecado original, Molina (1977 [1555 and 1571], 137r). *Tlatlacolpoliuiltzli*, pecado original, Molina (1977 [1555 and 1571], 137r). *Tlatlacoltzintiliztli*, pecado original o comienzo de pecados, Molina (1977 [1555 and 1571], 138v).

period, Fray Alonso de Molina records *tlatlacolli* as “sin” (“*pecado*”); “guilt” (“*culpa*”) or “flaw or defect” (“*defecto*”) (Molina 1977 [1555 and 1571], 137r). “*Mea culpa*” was for example translated with Nahuatl *notlatlacol*, literally expressed as “my damage” (Burkhart 1989, 32–33). The earliest and most outstanding (extant) colonial dictionary of Nahuatl is the Spanish-Nahuatl, Nahuatl-Spanish *Vocabulario en Lengua Castellana Y Mexicana Y Mexicana y Castellana*, published 1555–1571 by the Franciscan Fray Alonso de Molina, O.F.M (1513–1579). Molina, who had grown up in “New Spain,” prepared the dictionary with Nahua collaborators and informants.

Nahuatl is a polysynthetic or agglutinate language. It comprises complex words consisting of (several) morphemes or combinations of word elements. Accordingly, Nahuatl can express compound ideas with relative ease. The noun *tlatlacolli* derives itself from the intransitive verb *tlatlacoa*, which originates from the transitive verb *itlacoa*, “to damage, spoil or harm.” When the nonspecific object prefix *tla* is attached, the meaning is “to damage things (or something).” Burkhart maintains that *tlatlacolli* can be translated literally as “something damaged or corrupted.”²⁹ Molina records the possessive *tlatlacolli*, (*i*)*htlacoa*, which alludes to “something or someone being corrupted, spoiled, damaged; ruined or injured.”³⁰ Burkhart makes the case that *tlatlacolli* connotes a broad range of meanings: wrong deeds, faults, mistakes or something wrong in the sense of a criminal act. The word *tlatlacolli* does indeed have many different connotations in the *Florentine Codex* and in the dictionary of Molina associated with many types of intentional and unintentional misdeeds, offences, damages or errors like sexual (excesses),³¹ theft and intoxication according to Burkhart’s anal-

²⁹ Burkhart (1989, 10, 28). *Tlathalcoā*, to sin, to do wrong. Molina also includes in the entry “to damage, ruin something” which is the literal sense of the transitive (D)HTLACOĀ with the nonspecific object prefix TLA, Karttunen (1992, 263). *Tlahtlacōlchīhu(a)*, to sin, Karttunen (1992, 263). *Tlahtlacōleh*, sinner, Karttunen (1992, 263). *Tlahtlacōani*, sinner, Karttunen (1992, 263). Hacer daño, *itlacoa*. 274v., 246r., Olmos (1985 [1547], 218).

³⁰ Molina (1977 [1555 and 1571], 43r); Karttunen (1992, 100). *Itlactalhuia*, dañar algo a otro, Molina (1977 [1555 and 1571], 43rv). *Itlacauhcayotl*, daño, o estrago. *Itlacauhqui*, cosa dañada, or corropida, o muger reziempñada, o huevo huero y empollado. *Itlacauhtica*, esta malpuesta, desconcertada, o dañada alguna cosa. *Itlacau*, corromperse dañarse, o estragarse algo o empollarse el huevo. *Itlacauiliztli*, corrompimiento tal, o preñez de muger. *Itlacoa*, estragar o dañar algo. *Itlacoa*, enfermar por se dar mucho a mugeres, Molina (1977 [1555 and 1571], 43r). (*I*)*tlacoā*, to be corrupted, spoiled, damaged; to spoil, damage something. (*I*)*tlacahu(i)*, to go wrong, to be ruined or corrupted, to injure oneself, to spoil. (*I*)*htlactalhuia*, to ruin something for someone, Karttunen (1992, 100).

³¹ Sexual intercourse was associated with illness and death (*celicayotl itzmolincayotl*) among the Nahua: “A pregnant woman” was called *ococox*, *itlacahui*, meaning “to have fallen ill,” “to have been damaged.” Likewise, according to Molina’s dictionary, the terms *itlacauhqui*, *itlacahui*, and *itlacauhiztli* mean, in that order, “a damaged or corrupted thing, a newly pregnant woman, or a damaged or fertilized egg”; “to corrupt, damage or ruin something [...] or fertilize the egg”; and last, “corruption or a woman’s pregnancy,” López Austin (1997, 205). *Itlacau*, corromperse dañarse, o

ysis.³² Slaves were for instance considered to be damaged, *tlatlacoliztli* (Molina 1977 [1555 and 1571], 78r, 109r; Austin 1980, 463). Moreover, the concept is applied to characterize cultural defects of non-Nahua groups, things being off balance, destroyed, dislocated or displaced, duties being not executed etc. Even good (Nahuatl: *cualli*) day-signs of the 260-day calendar could be corrupted, *itlacauhtih* (Burkhart 1989, 28–29) as stated in the *Florentine Codex* (Sahagún IV, 9).³³

The Spanish ML translated catechisms, confessionals, sermons and other types of doctrinal scriptures into Quechua, and to a lesser degree, into Aymara in the Andean region (Durston 2007, 67–75, 105–115; Urton 2009, 817–818). They applied the term *hucha* from Quechua and Aymara to translate “sin” (“*pecado*”), “guilt” and “fault” (“*culpa*”).³⁴ “Sin,” “guilt,” “fault” and “debt” etc. are among the categories distinguished in Christian moral theology but not in Mixtec, Nahuatl, Quechua and Aymara. Non-Christian religions and languages outside the Americas illuminate equivalent structural differences. For example, E. E. Evans-Pritchard observed that a comparative linguistic-religious significance is lacking in the Nuer language of southern Sudan because there is no distinction between “sin” and “fault” (Evans-Pritchard 1967, 192). This suggests that a comparable ethical concept does not exist in Indigenous moral philosophies and religions. “Sin,” “crime” and “offence” could very well refer to moral wrongdoings or transgressions in a theological context but “guilt” conveys a quite different meaning, as do “shame,” “regret” and “remorse.” “Sin” is the accomplishment of the offence and transgression whereas “guilt,” “shame,” “regret” and “remorse” constitute the emotion of the individual after conducting the misdeed. There is accordingly an unambiguous semantic discrepancy between “sin”: “as the wrong act itself, the guilt which thereafter rests upon the sinner, and the consequences of the sin which fall sometimes on the sinner and usually on the innocent” (Burke 1961, 227–228). These Christian moral doctrinal principles do not correspond well with Indigenous ethic codes. For instance, for the Navajo of the southwestern United States “virtue is knowledge” since the moral code of misdeeds does not constitute willful acts but is the result

estragarse algo o empollarse el huevo. *Itlacauiliztli*, corrompimiento tal, o preñez de muger. *Itlacoa*, enfermar por se dar mucho a mugeres, Molina (1977 [1555 and 1571], 43r).

³²Cf. non-possessive lexemes—Molina (1977 [1555 and 1571], 137r–138v); Siméon (1997 [1885], 661–662); Karttunen (1992, 263)—and possessive lexemes Molina (1977 [1555 and 1571], 43r); Karttunen (1992, 100); Siméon (1997 [1885]) of *tlatlacolli*.

³³Burkhart argues that damaging at ritual or breaking the fast constituted a “sin” for the Nahua religion, Sahagún (1950–1982 [1565], III, 11–12), which brought on divine sanctions by the powerful deity Tezcatlipoca, Burkhart (1989, 31). But *tlatlacolli* is not employed as a religious concept for transgression in this passage from the *Florentine Codex*.

³⁴Harrison (1992, 13–14, 2002, 270, 2014); Urton (2009, 816, 818–823). Cf. Gónzales Holguín (1952 [1608], 199).

of not having ethical knowledge. Consequently, in Navajo moral conduct there is no concept of “sin,” as understood in Christian theology. Wrongdoings are “mistakes” but not “crime,” “guilt” or “sin.”³⁵

Various Moral-Linguistic Categories for “Sin” Translated from Maya, Mixtec, Nahuatl, Quechua and Aymara

In addition to the Mixtec noun *kuachi*, Reyes and Alvarado record the verb *dzatevui* for “to sin.”³⁶ *Dzatevui* is translated as: “to cause damage” according to Reyes.³⁷ This verb is also employed in the *Doctrina* by Hernández where *yo-*

³⁵Ladd (1957, 272). In the following brief summaries of linguistic examples from the *Florentine Codex*, “crime” or “transgression” would be a more appropriate translation than the Christian moral theological concept of “sin” or “guilt” for *tlatlacolli*: It is said that *tlahtlacōāni*, evildoers, were kept in jail, which consisted of a wooden house (*quauhcalli*), Sahagún (VIII, 44). *Tlatlacole* is something characterized as being bad: “he goes joining that which is bad (*tlatlacole*), the corner, the darkness, the secret road, He goes to seek, to find, that which is bad (*tlatlacole*),” Sahagún (XI, 268). In describing the deities whom the Nahuas worshipped Tezcatzoncatl (belonging to Centzontotochtli, “The Four Hundred Rabbits”) said that “he was the wine in times past considered full of sin (*tlatlacolli*)” because he killed people, Sahagún (I, 51). An admonishment of a dignitary states “[...] he censured the evils (*tlatlacolli*), which the ruler first mentioned,” Sahagún (VI, 79). In rhetoric and moral philosophy, *tlatlacolli* refer to fault defined as adultery and theft, Sahagún (VI, 259). In the trial “And in order that the ruler might verify one’s accusations and guilt (*tetlatlacol*) [...]” Sahagún (VIII, 54). A snake called *petzcoatl* is said not to be dangerous (*ano tle itlatlacol*), Sahagún (XI, 86). The errors (*tīlahtlacōl*) of a city, *altepetl*, Sahagún (VI, 58). On the day-sign of the 260-day calendar, One Dog (*Ce Itzcujntli*), a court of justice told people were to take a bath in Chapultepec “to lay aside their crimes (*in-īlatlacol*),” Sahagún (IV, 91). People born under the day-sign Nine Deer (*Chicunavi Macatl*) were said to be bad, “who brought others into sin (*tlahtlacōlnāmiectia*),” Sahagún (IV, 51). Likewise people born under the day-sign One Rabbit (*Ce Tochtli*) “they had incurred sin (*moīlahtlacōlnāmiectiah*)” and committed “great sin (*huetlatlacolli*),” Sahagún (VII, 24). A merchant who had done something really wrong (*otlatlaco/īlatlaco*), that is, a crime could be severely punished with the death penalty, Sahagún (VIV, 23). The bad featherworker and lapidary harms (*tlatlacoa*) and damages (*tlahtlacoa*) his feathers, Sahagún (X, 25–26). Sahagún outlines Indigenous deities in an appendix admonishing idolatry (*tlateuquīzilzi*) and “those who often call upon His holy name commit a sin (*tlatlacoa*),” Sahagún (I, 60). “When a fault had been committed (*otlatlaco*)” in the house (*calmecac*) of the religious specialists it had severe consequences for the transgressor, Sahagún (VII, 17). An illicit relation of a woman is described as “having erred” (*otlatlaco*), Sahagún (II, 103). Pulque may corrupt (*quihlacoa*) a human being, Sahagún (VI, 69). “Singers did something amiss (*quihlacoa*),” Sahagún (VIII, 56). “If some had done wrong (*quihlacoah*) in battle,” Sahagún (VIII, 53). Tezcatlipoca was angry when someone “had injured (*quihlacoaia*) the fasting,” Sahagún (III, 12). People “did not err (*quihlacoa*)” against Quetzalcōātl, Sahagún (X, 169). Sexual venereal diseases (*in āquin mihtlacoa*, “one who has a venereal disease) or excesses are characterized as *īlatlacoa*, Sahagún (XI, 154, 183, 174).

³⁶Alvarado (1962 [1593], 163); Los Reyes (1976, 11). *Dzatevui*, peccar, Los Reyes (1976, 115). Peccar. *yodzatevui*, *yonducundi kuachi yoquidzandi kuachi*, Alvarado (1962 [1593], 163). Reyes also incorporates the designation for a sinner: (*īay*) *yodzatevui*, el peccador o el que peca, Los Reyes (1976, 141). In his grammar Reyes uses *dzatevui* as an example of conjugation of the verbs, Los Reyes (1976, 57–62).

³⁷*Yodzatevui*, dañar. *Nitevui*: dañose, Los Reyes (1976, 141).

dzatehui can be rendered as to “perish,” “damage,” “pervert” and “make rot,”³⁸ which is contrasted with *chihi ñuhu* (“poner como Ñuhu”), which signifies, “to venerate God” (“venerar a Dios”).³⁹ *Dzatevui* is used among contemporary Mixtecs of Chayuco with the implication of “destruction.”⁴⁰ Moreover, Fray Andrés de Olmos records various Nahuatl verbs⁴¹ for “sin”—not containing the roots for the nouns *tlatlacolli* or (as we shall see) *tlapilchihualli* (*tlapilchializtli*)—but *molicie* (“to hurry oneself”), *xixitla* (“urinate” or “defecate”) and *machihua* (“do not do or make something”).⁴²

The ML did not only make use of the noun *tlatlacolli* as a translation for “sin” in Nahuatl but also the concepts *tlapilchihualli* or *tlapilchializtli*. Molina records *tlapilchiua* as “sin” (“*pecado*”) or “defect or flaw” (“*defecto*”) (Molina 1977 [1555 and 1571], 132r), with the connotation of “guilt” or “fault,” as a synonym for *tlatlacolli*.⁴³ This concept is also recorded by Alonso Urbano in his trilingual Spanish-Nahuatl-Otomí dictionary from 1605.⁴⁴ But what does this concept refer to linguistically? The root word is *pilīn(i)*.⁴⁵ I analyze the meaning of *tlapilchihualli* or *tlapilchializtli* as “make something wither or deflate,”⁴⁶ which accordingly signifies moral deficiency (Kirkhusmo Pharo Forthcoming(a)). It is therefore interesting that the *Florentine Codex*, the preeminent source of non-European/non-Christian Nahua moral philosophy employs *tlatlacolli* and *tlapilchihualli* or *tlapilchializtli* interchangeably.⁴⁷ As in Catholicism, the Nahua practiced “confession” of “sins.” The Nahua confessed wrongdoings to

³⁸“Echar a perder, dañar, pervertir,” “hacer pudrir,” Jansen and Pérez Jiménez (2009, 154).

³⁹Jansen and Pérez Jiménez (2009, 215). Cf. *Dzo eeni kuachi, ña niquidzata kuachi ñaha dzehe, tay kuachi tay taqui ñuhu nicuhuita*. Pero esto fue su único pecado, no hizo pecado con mujeres, mozo virgen fue, Jansen and Pérez Jiménez (2009, 216).

⁴⁰*Zatívi*, yo, lo destruimos, Pensinger (1974, 58).

⁴¹Cf. also Carochi below.

⁴²*Pecar generaliter, nitlatlacova, nitlapilchihua*, Olmos (1985 [1547], 101). *Pecar generaliter* [en general], *itlacoa; pilchihua*. 279v., 274v., Olmos (1985 [1547], 235). *Pecar/pecatuz (sic.) molicie, ninoxixitla, ninomachihua*, Olmos (1985 [1547], 101). *Pecar pecatuz* [cometer el pecado de] *molicie, xixitla, machihua*, Olmos (1985 [1547], 235).

⁴³*Tlapilchializtli*, pecado, o defecto, Molina (1977 [1555 and 1571], 132r). *Pecado, tlatlacolli, tlapilchializtli*, Molina (1977 [1555 and 1571], 93r). *Defecto o culpa, tlatlacoli, tlapilchiualli*, Molina (1977 [1555 and 1571], 37r). *Culpa, pecado, o defecto*, Molina (1977 [1555 and 1571], 33r). *Falta por culpa, tlatlacoli, tlapilchiualli, tlapilchializtli*, Molina (1977 [1555 and 1571], 62r). *Tlapilchiuani*, defectuoso, o pecador. *Tlapilchializtli*, defecto, cosa malhecha, o pecado. el acto de pecar. *Tlapilchiuhtli*, cosa malhecha, o culpa cometida, Molina (1977 [1555 and 1571], 132r). *Pilchiua*, pecar o hazer algun defecto, Molina (1977 [1555 and 1571], 81v). *Tlapilchihual-li*, sin, failing, Karttunen (1992, 291).

⁴⁴*Pecado, tlatlacolli, tlapilchializtli*, Urbano (1990 [1605], 328v).

⁴⁵*Pilīn(i)*, to wither, to deflate, Karttunen (1992, 195). Cf. also F. Brewer and J. G. Brewer (1971, 174).

⁴⁶tla-pil-chihua-lli; something-wither/deflate-make-ABS.

⁴⁷Cf. Sahagún (VI, 29–34).

the deity Tlacolteotl (“Goddess of vice”) of evil, perverseness, lust and debauchery Sahagún I, 23). The penitent or wrongdoer called, *tlapilchihualeh*, “confesses” his or her “sins,” *tlapilchihualiz* (Sahagún I, 24–25). He or she is said by the soothsayer (*tlapouhqui*) to overcome (*poliuitz*) his or her faults (*motlatlacol*) and his or her “sins” (*motlapilchioal*) through “penance” and ritual practice of self-sacrifice. The “sins” and “penance” (*tlapilchihualli*) were also offered to the Lord of the near and the nigh, Tezcatlipoca (Sahagún I, 26). Tlacolteotl “for-gave” the “sins” of the “confessor.” He/she could confess moral transgressions to calendar specialists of the indispensable 260-day calendar, *tlapouhqui*, who demanded “penance,” “expiation” and “cleansing” of “faults” (*tlatlacolli*) and “sins” (*tlapilchihualli*) (Sahagún I, 8–11). As a worship of Tlacolteotl, “confession” by not only the Nahuatl but the Mixtecs of his or her “faults” and “penance,” that is, *tlapilchihual* was presented to the religious specialist when he or she was about to die (Sahagún VI, 34). *Tlapilchihualli* or *tlapilchihualiztli* is, however, not employed in contemporary Nahuatl (John Sullivan pc, 16 November 2010) or by Protestant ML (i. e. SIL or Wycliffe Bible Translators) of the twentieth and twenty-first centuries.⁴⁸

The Nahuatl moral concept *tlazolli*, that is, “pollution” or “filth” may seem to be an appropriate non-Christian Nahuatl word for “sin” or transgression.⁴⁹ “Sin” is represented in the pictorial Catholic colonial catechism “Gante I” with *tlazolli* (Boone 2011, 207–208) and not the word *tlatlacolli* (or *tlapilchihualli*), which is commonly used in alphabetic script.⁵⁰ This choice of translation was probably made because “filth” is a graphic (concrete) concept easier to communicate as a metaphor than the more abstract “something damaged” (*tlatlacolli*). *Tlazolli* is associated in particular with sexual transgression and is connected to the deities Tlazoteotl (“filth deity”)⁵¹ and Tezcatlipoca (Pettazzoni 1929; 1931; Austin 1980, I, 250; Burkhart 1989, 91–93).⁵² Tlazoteotl was associated with the five Cihuateteo earth deities whose purpose was “adultery” (*tetlaximalitzli*) according to Sahagún’s *Primeros Memoriales* (Burkhart 1989, 92). In his grammar (*Arte*) The Jesuit ML Horacio Carochi provides lexical examples of Nahuatl metaphors, associated with filth, for “sin”: “The verb *potōni*, “to smell bad”; “stink” from the possessive pluperfect “*nopotōnca*, my stench, and metaphorically my sins.” “*Īyāc*, something foul smelling [...] Metaphorically our sins are

⁴⁸Cf. Kirkhusmo Pharo (Forthcoming(a)).

⁴⁹Cf. Burkhart for the etymology of *tlazolli*, Burkhart (1989, 87–89).

⁵⁰Cf. K. Th. Preuss *Die Sünde in der Mexikanischen Religion* (1903) for an analysis of the representation of the concept of “sin” in Nahuatl pictorial-logographic manuscripts.

⁵¹Tlazoteotl is a Huastec, Olmec and Mixtec (of the Atlantic coast, south of the state Veracruz, Mexico) goddess whom people “confessed” to according to the *Florentine Codex*, VI, 7.

⁵²The term for “gold” in Nahuatl is *teocuitatl* (“divine excrement”). Ordure and filth was an Aztec symbol for gold, the sun, urine and “sin,” Lipp (1998, 76–77); Preuss (1903, 257, 1906, 355–356).

called *tīyāca*, our stench; *tocatzāhuaca*, our filth, from the adjective *catzāhuac*, something dirty; [...] *Topalānca*, our rottenness, from the verb *palāni*, to rot” (Carochi 2001 [1645], 192–194). Moreover, Carochi combines “filth” with “sinner”: “*īcatzāhuaca* or *īcatzāhuacāyo* in *tlātlacoāni*, the filthiness of the sinner” (Carochi 2001 [1645], 194–195).

Although not making a theological exegesis, Carochi indirectly opposes lexemes for “filth” with concepts for “something clean” or “pure,” *chipāhuacāyōtl* and *qualnēci*, “beauty” or “to have good appearance” referring to Virgin Mary: “*īchipāhuacāyōtzin īqualnēzcāyōtzin* in *ilhuicac cihuāpilli*, the purity and beauty of the Queen of heaven” (Carochi 2001 [1645], 194–195). The moral system of the Nahua is comprised of a dichotomy of “purity” (*chipahua*) and “pollution” or “filth” (*tlazolli*) where the latter is associated with a concept of damage, chaos and anti-structure, that is, corresponding to *tlatlacolli*, according to Burkhart (1989, 87–91). To my knowledge there are, however, no philological or linguistic evidence in the extant sources for an intimate relation between *tlatlacolli* (or *tlapilchihualli*) and *tlazolli* or other words for “filth” or “pollution” in the moral philosophy of the Nahua.

Regarding the concepts of “filth” and “pollution” as opposed to purity, it can be useful to examine comparative examples from other moral systems. Robert J. Priest has identified a rich vocabulary practiced for “moral evil” in the language of the Aguaruna-Jívaro from Peru (Priest 1997, 30–31). He emphasizes filth, as does Burkhart for the Nahua (1989) and Paul Ricour’s *The Symbolism of Evil* (1967), as a transcultural symbolic concept for moral evil (Priest 1997, 33). Guilt after defilement can be removed through a purification ritual, whereas guilt as debt can be removed through offering gifts (Priest 1997, 33). Among the Nahua sex and filth were associated with “sin” with the metaphor (Sp. difrasismo) in *teuhtli*, in *tlazolli* or “the dirt, the trash” according to Alfredo López Austin (López Austin 1997, 205). But Pettazzoni maintains that the sexual nature of Tlazoteotl is intimately associated with motherhood as represented in the Nahua pictorial-logographic manuscripts *Codex Borbonicus* (p. 13), *Codex Vaticanus B* (p. 41, 74) and *Codex Borgia* (p. 16) (Pettazzoni 1931, 192–193). Tlazoteotl is connected to fertility and vegetation, which is symbolically related to sexuality (Pettazzoni 1931, 198). This beneficial function of Tlazoteotl suggests that *tlazolli* did not have an exclusive evil or anti-structural moral meaning corresponding to “sin.” Christian moral dualism with a radical dichotomy between “good” and “evil” do not exist in Indigenous philosophical systems where there is a complimentary relation between these two notions.

Colonial ML applied both *keban* and *çibil* or *zipil* as translations for “sin” in Yucatec Maya of the Yucatán Peninsula of Mexico. But *keban* is associated with Christian moral doctrine whereas *çibil* (*zipil*) relate to all other offenses according

to William F. Hanks (2010). While *keban* seems to be associated with “confession,” this significance does not apply to *çibil* (*zipil*). As opposed to *çibil* (*zipil*) in the dictionaries *keban* is connected to negative emotions. For example, “In the ‘Our Father,’ ‘we’ are said to forgive the *çibil* (*zipil*) of others but not their *keban*.” Moreover, in the *doctrina keban* is differentiated into mortal and venial “sins” but *çibil* (*zipil*) does not have these connotations (Hanks 2010, 137, 196–202, 265). Can a ML secular and a religious dichotomy translation of these Yucatec Maya concepts, also be the case for the Nahuatl nouns *tlatlacolli* and *tlapilchi-hualli*?⁵³ In the Spanish-Nahuatl section in the dictionary of Molina (1977 [1555 and 1571], 94v) and in the dictionary of Urbano (1990 [1605], 328v) only *tlatlacolli* is combined in the entries with Christian theological concepts: “original sin” (pecado original), “mortal sin” (pecado mortal), “great sin” (pecado grande), “venial sin” (pecado venal), “sin that can be purified through sacrifice” (pecado que se purga por sacrificio). *Keban* and *tlatlacolli* were therefore most likely appropriated by the ML in translations of the Christian moral concept “sin.”

The Quechua dictionary of Diego Gonzalez Holguín (1952 [1608]), an anonymous Quechua dictionary of 1586⁵⁴ and the Aymara dictionary of Ludovico Bertonio (1879 [1612]) translate “sin, business, occupation or work, contract, dispute, debate” with both *hucha* and *cama*.⁵⁵ Because of language contact for more than a thousand years, Aymara and Quechua, which are of two different Andean language families, have quite a few grammatical features and lexical items in common.⁵⁶ *Hucha* has the meaning of “sin” in the genitive, whereas it has the meaning of “business” without the genitive (Zuidema 1982, 425–429). Gerald Taylor associates “sin” (transgression by an offender), law and transactions with *hucha* whereas *cama* refers to an animating force from a deity or ancestor implying debt and (ceremonial/reciprocal) obligation. Therefore it “imply debt and obligation to the community, for the originating force emanates from the deities.” Also for the Andeans *hucha* signified a debt to society, a social and political transgression towards the common good. According to Taylor, in Catholic moral doctrine *cama* and *hucha* both received the meaning from “a debt not repaid, an obligation not carried out, similar to the relationship in Spanish between *deber* (to owe) and *deuda* (debt).” *Cama* and *hucha* both originally refer

⁵³A systematic analysis of the variety of Indigenous moral-linguistic concepts can contribute to expound non-Christian Indigenous moral philosophies and practices.

⁵⁴Not every colonial dictionary in colonial Quechua registers, however, both *cama* and *hucha* for “sin,” only *hucha*, Harrison (2014, 95).

⁵⁵*Cama*, peccado, Bertonio (1879 [1612], 34). *Cama, vel hucha*, negocio, Bertonio (1879 [1612], 34). *Hucha, vel hoch*a, peccado, negocio, pleyto. *Huchani, Camani*, peccador, y uno que tiene muchos negocios o pleytos, Bertonio (1879 [1612], 160). *Cama*, El pecado, o culpa, Gónzales Holguín (1952 [1608], 47). *Hucha o cama*, Peccado, o negocio o pleyto, Gónzales Holguín (1952 [1608], 199).

⁵⁶Cf. Adelaar (1986); Heggarty (2005); Cerrón-Palomino (2008).

to reciprocity between human beings and society and deities or ancestors. *Cama* refers to structure, order and harmony whereas *hucha* is the negative opposite. As a negative word, *hucha* became the preferred moral term for “sin” for the ML.⁵⁷ Alan Durston and Gary Urton maintain that the Quechua noun *cama* with the meaning of “task,” “order,” “creation” (“structure”) “responsibility,” not related to the verb *cama*,⁵⁸ constitutes an antonym to *hucha* (disorder; destruction) or “sin”—the latter was used in the religious terminology of the Third Council of Lima (1583) in Peru.⁵⁹ This case represents an illuminating example of the difficulties in establishing meaning of moral-linguistic categories of Indigenous philosophies and their translations (semantic extension) into European (Christian) terminology.⁶⁰

The ancient Hebrews and Greeks had many different Biblical words (c. 20) translated into the English term “sin.” None of these concepts were, however, originally applied with a religious meaning as “a term speaking of moral failure in relationship to God,” which they were given later (Priest 1997, 29–30). It has been established that various colonial ML and EM operating among Indigenous peoples in the Americas acquired words from both the religious domain and the non-religious domain in order to give these a Christian theological moral value of “sin.” That the EM and ML employed various concepts for “sin” appropriated from both an Indigenous religious and non-religious linguistic context suggests that they had a serious predicament in their endeavor to obtaining knowledge of Indigenous moral philosophy.

⁵⁷Harrison (1992, 12–15, 1993, 172–174, 2014, 95–98); Taylor (1987, 30); Salomon and Urioste (1991, 16).

⁵⁸The verb *cama* outlines a “divine activity of infusing a vital force into living things and was used by the ML for the Christian concept of creation,” Durston (2007, 208, 211, 215).

⁵⁹Durston (2007, 215, 238); Urton (2009, 816, 821–823). Regina Harrison has summarized the scholarly explications of *hucha* and *cama* in Andean moral philosophy and later colonial Catholic doctrine, Harrison (2014, 95–114, 128).

⁶⁰Scholars have noticed the use of corresponding translated Mesoamerican Indigenous concepts for crime and sin both in judicial and religious contexts by ML in the colonial period, Terraciano (1998); Sousa (2002); Yannakakis (2014).

Confession, Penance and Forgiveness of Moral Failure (“Sin”) in Indigenous and Catholic Moral Philosophy

Conceptions of “confession,”⁶¹ “repentance” and “forgiveness” of various moral wrongdoings and transgressions (“sins”) exist in quite different moral-religious systems.⁶²

In a comparative study Gary Urton argues that the Inka and European colonial Catholic cultures had a fundamentally equivalent rational concept of “sin” and “confession.”⁶³ A governmental bureaucratic system of double entry book-keeping of the equilibrium of checks and balances and debit and credit as well as its moral equivalent of recording “sin” and “confession” was developed independently in Europe and the Andean region to maintain social authority and the structure of the divine order. The respective accounting and bookkeeping or record-keeping (*kipu* for the Inka) systems registered individual transgressions and asocial actions that threatened to undermine society by the rhetoric of double entry. This constituted a statistical and political arithmetic of collecting and organizing data in order to survey and control the moral behavior of the people.⁶⁴ The Indigenous (Inka) chronicler Felipe Guáman Poma de Ayala (c. 1535–c. 1615) outlined the organization of accountants where the upper level of the Inka hierarchy contained an official called *contador mayor hatun hucha quipoc* (major accountant of the great “sin” *kipu*) while at a lower level was the *contador menor huchuy hucha quipoc* (minor accountant of the small “sin” *kipu*). The accountants of “sin” mediated between the sinners and the confessors. The religious specialists divined the cause and origin of the “sinful” actions by ritual techniques. They also demanded the sinners to perform penance (Urton 2009, 819).

The concepts of “sin” and “confession” have, however, fundamental semantic discrepancies in Christian and Indigenous moral philosophies respectively. Sahagún adopted the Nahuatl moral categories *neyolcuitiliztli/neyolmelahualiztli* (“confession”) and *tlamacehualiztli* (“penance”) transferring Christian theological doctrine (Klaus 1999, 93, 140). The non-Christian Nahuatl acknowledged (“confessed”) their carnal transgressions of adultery (“sins”) to the deity Tlazo-

⁶¹“Confession” constitutes an oral declaration and symbolic practices with the purpose to revoke “sin,” Pettazzoni (1953, 263–264).

⁶²For the Nuer, confession at sacrifice in order to expiate “sin” may reveal resentments and accusations towards other people. Sacrificial rituals erase the transgression but “[...] not even sacrifice is sufficient by itself to change it, only sacrifice which carries with it the will and desire of the sinner,” Evans-Pritchard (1967, 190–193).

⁶³Harrison conducted made in-depth analysis of translations of sin and confession in colonial Quechua in Peru, Harrison (2014).

⁶⁴Cf. Urton (2009). I am grateful to Gary Urton for giving me a copy of his article.

teotl, as related by Sahagún in book I, chapter XII and book VI, chapter VII of the *Florentine Codex* (Pettazzoni 1931, 198–199, 208). Guilhelm Olivier maintains that the deity Tezcatlipoca was the “master of penance and confession” forcing the Nahua to “repent” their moral transgressions through ritual fasting and offering. This could be both an individual and a communal admission (Olivier 2003, 24–25) whereas Christian acts of “confession” of “sins” constitutes an exclusive act of individual, not communal, repentance with the purpose to obtain forgiveness from “sin” in order to achieve future salvation (redemption) from God in an eternal life after death.

The Mixtec word for “confess” is recorded with the entry *yonamandi*⁶⁵ in Catholic colonial vocabularies.⁶⁶ *Nanama*, “the act of confessing,” is applied in the *Doctrina* as an admonishment to “straightening ones heart” (*quidzandaa quidzacuite yni*). A verbal metaphor of the “heart” is equivalent to the non-Christian Nahuatl word for ritual of confession or *neyolmelahualiztli*, “the act of straightening the heart” (Burkhart 1989, 81–182) according to Terraciano (2001, 305–306, note 326).⁶⁷ For the Nahua of the pre-Christian European era, the purification rite of confession—when slaves of merchants were sacrificed (Sahagun IX, 56, 59) *teiolmelaoa*, “it straightens people’s hearts”—was called *neyolmelahualiztli*, “straightening one’s heart.” This notion the Catholic colonial missionaries later employed to designate Christian confession. The verb “to confess” is *yolmelahua* or *yolcuitta*.⁶⁸ In the *Florentine Codex* *yolcuitta* is applied in various contexts of Nahua religious practice. “Confession” to the deities Tlazoteotl and Tezcatlipoca, (Sahagún I, 23–27; VI, 29–34) was articulated by “in her presence confession was made, the heart was opened; before Tlazolteotl one recited, one told one’s *tlachihual*” (*iixpan neyolcuitilo, iixpan neyolmelahualo, in tlazolteotl, iixpan mopoa, mihtoa, in tetlachihual*) (Sahagún I, 24). Moreover, the Huasteca is said to: “not to confess” (*ahmo nō moyōlcūitiāyah*) to the deity Tlacolteotl because covetousness was not conceived as a wrongdoing in their religion (Sahagún VI, 34). Admitting transgressions to a deity or to religious specialists was not foreign to Nahua moral philosophy because there was a non-Christian word for this practice in the language. But *yolmelahua* or *yolcuitta* were never combined with a conception of obtaining “salvation” or avoiding eternal perdition (damnation).

⁶⁵Mixtec phrases were employed to translate “confession” by ML. Cf. “*ña nacuhui yoyuhuindo cachi kuachindo*, no es posible que temáis confesar vuestros pecados,” Jansen and Pérez Jiménez (2009, 225–226).

⁶⁶*Yonamandi*, confersares por 1^a. vez. *Yona nãmandi*, confersares por 2^a. o 3^a o más veces (Los Reyes 1976, 34). *yonamandi*: confesar, Alvarado (1962 [1593], 55r).

⁶⁷Cf. corresponding terminology in the Mixtec dictionary of Alvarado (1962 [1593], 50).

⁶⁸Burkhart (1989, 181–182). *Yolcuitta*, confersarse, confesar a otro, Molina (1977 [1555 and 1571], 40v). *Teyolcuitiliztli*, confession, que haze el confessor, Molina (1977 [1555 and 1571], 95v). Confesar al confesor, *yolcuitta*; *yolmelhua*, 265v., 232v., Olmos (1985 [1547], 198). Confesar delito, *cuitta*, 265v., 232v. Confesar lo que sabe, *machitoca*, 267r., 255r., Olmos (1985 [1547], 198).

The ML simply appropriated these words and gave them a novel ethical definition in Nahuatl.

Finally, let us look at the translation of the Christian doctrine of “forgiveness” of moral wrongdoings, which further corroborates the radical difference between soteriological and non-soteriological moral philosophies/religions. The Nahuatl word for “forgiveness” or *tetlapopolhuiliztli* was taken over by the Catholic colonial ML.⁶⁹ Molina includes the entries *tlahtlacolpohpolhuiliztli*, “forgiveness of sin” and *tlatlacolpopohuia*, “to pardon sins, to grant absolution.”⁷⁰ Burkhart maintains that the lexeme *tetlapopolhuia* “pardon” or “forgiveness” of a moral transgression refers to “to destroy things in regard to someone” (Burkhart 1989, 144). It is remarkable that the root of the word has, besides “pardon someone,” the semantics of “to destroy something for someone,” that is, the transgression or fault with “the lexicalized sense of specifically obliterating someone’s sins or guilt.”⁷¹ In the appendix to book I of the *Florentine Codex*, where Sahagún refutes “idolatry” and criticizes “idolaters,” he employs *pohpolhuia* in a Christian ethical context saying that the Lord *in tlahtlacoānih ahmo niman tiquimmopohpolhuia* or “Thou dost not at once destroy sinners” (Sahagún I, 60), but which also can signify “Thou dost not at once forgive sinners” making *pohpolhuia* an ambiguous moral conception. A quite different idea of pardon or forgiveness exists in non-Christian moral philosophies and practices in Mesoamerica. It is related in the *Florentine Codex* that during the ceremonies during the Nahua 365-calendar time period of *Tecuilhuitontli*, peoples intoxicated with pulque abused other people but “the offense was pardoned” (*motlapohpolhuia*), that is, “destroyed” according to the translation of Dibble and Anderson (Sahagún II, 95). In non-Christian morality the semantics of the root *pohpolhui* refer to “destruction” or “perdition” (Sahagún I, 60; III, 4; IV, 24, 25, 43, 45, 69, 93, 102, 105; IX, 87; X, 30, 31, 48; XII, 1), “disappearance” (Sahagún VII, 81) and “consumption” (Sahagún VI, 48, 55), but boded neither the (Christian) promise of salvation nor threat of perdition.

⁶⁹*Tetlapopolhuiliztli*, perdon o dispensacion hecha a otro, Molina (1977 [1555 and 1571], 109r). *Tlapopolhuia/tlapopolhuilia*, perdonar a otro, o dispensar con alguno, o echar suertes de baxo del arena, o dela tierra, Molina (1977 [1555 and 1571], 133v). Perdonar a otro, *tlapopolhuia*, 279r., 231r., Olmos (1985 [1547], 236).

⁷⁰Karttunen (1992, 263). *Tlatlacolpoliiliztli*, remissio o perdon de pecados. *Tlatlacolpopohuia*, perdonar, o absoluer de los pecados, Molina (1977 [1555 and 1571], 137r).

⁷¹Karttunen (1992, 201). The original meaning of *tlapohpol* is “disappear, to lose or to consume, destroy, obliterate something” Molina (1977 [1555 and 1571], 133); Karttunen (1992, 201); Brockway, Hershey de Brockway, and Santos Valdés (2000, 116).

Moral Transgression (“Sin”) in Non-soteriological and Soteriological Knowledge Systems

An ideological or epistemological system consists of a terminology of one or a few core concepts and a quite few additional interrelated key concepts. This means that core concepts epitomize the primary idea and/or knowledge, although they are inevitably related to the important secondary key concepts. In his analysis of Quechua mathematics, Urton exemplifies this analytical model with the verb “to add.” This core concept encompasses the key concepts “augment”; “increase”; “extend”; “unite” etc., where each moderately interconnects with “add” (Urton and Llanos 1997, 143–144). An equivalent methodology of analyzing concepts representing ideas and knowledge provides a constructive approach to an explication of the essential principles of various moral epistemological systems.

There are great local variations between different Indigenous American religions/moral philosophies and languages. But the translated Christian core concept “salvation” demonstrates that there is a fundamental philosophical difference between Christianity and Indigenous epistemological knowledge. The Christian key concept of “sin” cannot be comprehended without related moral theological concepts. The antonyms “salvation” and “sin” constitute a moral dualism of good and evil. In colonial Christian soteriology, salvation is understood as liberation of evils or sin. A redemption or deliverance of sin will result in eternal life with God. The idea of salvation rests upon there being some sort of unsaved sinful state by moral corruption and transgression from which the individual (and mankind) is to be redeemed or condemned to perdition.

The key concept of “sin” as is the case with “repentance” and other ethical notions, are closely related to the core conception of “salvation” and “damnation” in Christian moral-soteriological theology. This gives it a particular meaning quite different from similar or apparent synonymous moral-linguistic categories in Indigenous languages. One of the quandaries, not only in the translation enterprise of missiology and theology but also anthropology,⁷² is whether the concept of “sin,” as a Christian idea, can be used outside this religious context. Problematic translations of moral-linguistic concepts in non-soteriological religious systems appear in both anthropologic scholarships as well as in missionary scriptural translations.

I advocate that the key concept “sin” and related Christian theological notions—“repentance,” “conversion,” “faith,” “baptism,” “confession” etc.—can only be defined in relation to the core moral-soteriological concepts: “salvation”

⁷²For instance, in explicating Indigenous moral philosophies/religions Andeanists disagree on whether to apply this translated term, cf. Urton (2009, 822, note 9).

and “eternal perdition” (“damnation” or “judgment”).⁷³ The Christian notion of “sin” cannot be translated into languages of non-soteriological or non-missionary-religions in missiology/theology and should not in comparative religious studies and anthropology, because it bears neither a transcendent or metaphysical dimension of “salvation” or “perdition” (“damnation”). This is simply because, the consequences (divine judgment) for “sin” differ in soteriological and non-soteriological ethics. Moreover, the Christian moral doctrine of individual soteriological “sin” is radically opposed to an Indigenous moral philosophy of collective “transgression” or “wrongdoing.”

Moral prescriptions and epistemology exist in every society where ethical precepts regulate the social order. Culture therefore contains principled imperatives and values, which sanction transgressions against religious mores, divine order, and judicial and social conventions. Moral contravention—expressed in Christianity by the concept “sin”—has certain theological-judicial consequences, however. In a soteriological-eschatological religion like Christianity there are two possible final outcomes for the individual human being: either eternal salvation or eternal perdition post mortem. Conversely, within a non-soteriological moral system, such a judicial idea of a metaphysical or transcendental destiny does not exist. Indigenous moral systems of the Americas do not conceptualize individual wrongdoings or transgressions (“sin”) associated with a subsequent metaphysical post mortem judgment where the outcome consists of either personal salvation or perdition. For Indigenous American peoples the consequences for committing moral crimes against the divine order can be severe, but concerns only the social and the natural (mundane) and not a transcendental world. The wrongdoings or transgressions can be corrected through (symbolic) ritual practice.

In an effort to translate the moral system of a non-Western and non-Christian culture, “sin,” however imprecise, has been a much preferred notion by various anthropologists. J. Goetz calls “sin” a breach of taboo and a relation with impure objects among so-called “primitive people” (Goetz 1960), whereas Hywel D. Lewis identifies two common features of “sin”: “moral evil, something you are blamed or held accountable of, and offence against deities” (Lewis 1973, 149, 151). Bleeker (1973, 74) maintains that ethical “sins” constitute murder, robbery and adultery and cultic transgressions (abusing the deities and not observing the prescribed rituals, cosmic “sins” like crimes against nature). The Nuer have a concept of “sin” that is associated with “a breach of interdiction” of various transgressions or violations followed by divine (religious) sanction in this world, different concepts of which exist in

⁷³The related problem of translating the moral dualism of good vs. evil of Christology where the concept of Jesus Christ (good) opposes the Devil (evil).

their language according to Evans-Pritchard (1967, 177). In his analysis of pre-Christian Mesoamerican religions, Alfredo López Austin insists on employing the translated concept “sin” (pecado). He argues that this moral category, which has “many conceptual variations” in different religious concepts, “is found in all deist religions.” López Austin uses the term “sin” as a synonym for transgression against a “divine order” either by human beings or by gods (López Austin 1997, 46, note 9). In the same manner as the scholars quoted above, Robert Hertz in *Le péché et l’expiation dans les sociétés primitives* (1922) also avoids making the necessary distinction between the soteriological religions with non-soteriological religions. Because they do not distinguish between the consequences for committing “sin” in the soteriological or non-soteriological system. “Sin” (péché) is a transgression of the moral order, which implies severe mundane (i. e. non-soteriological) penalties for the instigator, but none in the afterlife (i. e. soteriological)⁷⁴

In *The Sense of Sin in Cross-Cultural Perspective*, Christoph von Furer-Haimendorf constructed an interesting analytic model in order to explicate the various uses of the concept of “sin.” He argues that “sin” outlined in numerous European-American Christian languages (“peccatum,” “péché,” “sin,” “Sünde,” “synd” etc.) expresses the same idea but becomes problematic when compared with, that is, translated from, linguistic concepts in non-Christian religions (von Furer-Haimendorf 1974, 540). Furer-Haimendorf made the following classification of categories of moral systems in the world:

Category A embraces all those societies whose ideologies discount any causal link between human actions of a moral nature and the intervention of supernatural powers in the fortunes of men either in this life or in a life beyond death. Category B includes societies which recognize that certain human actions, such as breaches of taboos, do bring about an intervention of supernatural powers, but assume that any sanctions exercised by such powers are restricted to man’s fortunes in this life, and do not affect his fate after death. Category C consists of societies which believe in a universal moral order, according to which all human actions are rated as either morally positive, and hence generating merit, or morally negative and hence diminishing a person’s store of merit. Rewards and punishments are believed to be automatic without the intervention of divine powers, and they are located in the life after death, either in the form of reincarnation or in heavens and hells. Category D, finally, is made up of all those societies that believe in a personal God or a number of deities acting

⁷⁴Cf. Hertz (1922, 51–52).

as guardians of the moral order and rewarding or punishing man's actions in the hereafter." (von Fürer-Haimendorf 1974, 553–554)

Judaism, Christianity and Islam—where retribution or punishment and “reward,” that is, salvation, represent the central religious moral doctrine—belong to category D according to Fürer-Haimendorf (1974, 554), whereas the pre-Christian Nahua religion belongs to category B according to Burkhart (1989, 30–31). Category B—where there is a divine intervention during the human life span but not a religious doctrine of a post mortem eternal judgment affecting moral behavior—does apply to Indigenous moral philosophies of the Americas. To be saved in Christian theology is to be rescued from hell and redeemed by God in heaven. Oxtoby is exactly right when he writes that in “Christian theology, in effect, salvation is not a comparative category at all, but a unique one” (Oxtoby 1973, 29). The morphology of salvation in non-Christian moral philosophies constitutes relief of the human condition in the human world from insecurity and danger, which can be obtained by ritual (sacrifice) (Oxtoby 1973, 31, 33). Furthermore, Pettazzoni distinguishes between the subjective, or the will to “sin,” and the objective, or the reality of the “sin,” the fact of “sin.” For non-Christian religions the latter constitutes evil, which is followed by suffering and misfortune (Pettazzoni 1953, 266). Evil and misfortune constitute a sign for a “sin” being committed without will or previous knowledge. Instead “sin” as a religious concept is a violation of the sacred order by transgressing certain taboos or committing offences followed by divine punishment and suffering. The non-Christian seeks “salvation” or rather deliverance in this world from terror, misfortune or pain (Pettazzoni 1953, 267–268).

Despite this fundamental structural ontological difference, there is considerable variation between the many indigenous religious cosmological and moral systems. In the book *A Native American Theology* (2001), scholars of various Indigenous cultures in North America—Claire Sue Kidwell (Choctaw/Chippewa), Homer Noley (Choctaw) and George E. Tinker (Osage/Cherokee)—question the religious dogma of the concepts of “deity,” “Christology,” “sin” and “eschatology” of Christian theology compared to American Indigenous religions. They contend that the concepts of “sin” and “salvation,” outlining a moral doctrine of human evil and corruption, do not exist in Indigenous languages of the Americas (Kidwell, Noley, and Tinker 2001, 18–19):

From the Indian point of view, sin can be defined as a failure to live up to one's responsibility, sometimes deliberately but more likely as a result of impulsive or unthinking behaviour, a mistake. Salvation can be defined as the ability to return to a state of communitas. (Kidwell, Noley, and Tinker 2001, 19)

“Sin” constitutes a personal responsibility for individual salvation in Christianity. But in many Indigenous cultures moral transgressions and their consequences are not related to the individual human being but to family (ancestors and descendants), kinship, clan and/or the community. For instance, collective transgressions because of lack of game make up an important part of the belief of the Iglulik Eskimo according to Knud Rasmussen (Hallowell 1939, 195, note 3; Rasmussen 1929, 123). For the Nuer, wrongdoings not only affect the culprit but also non-responsible people (Evans-Pritchard 1967, 189). *Hucha* suggests “debt and obligation to society” according to Inka moral philosophy. R. T. Zuidema (1982) maintains that it was considered *hucha* to do or think badly against a lord or to not fulfill ritual obligations according to the calendar. Taylor (1987, 30) points out that *hucha* represented a combination of sin, transactions and law with morality to perform ritual duties.⁷⁵ For the Inka, the concept *hucha* was associated with acts towards the community and failure to perform (ritual) obligations to the sacred order rather than personal faults and moral thinking of the individual. *Hucha* can, according to Harrison, be perceived as an unsettled debt to society (Harrison 1992, 13; Urton 2009, 819–820). Moral flaws constituted a breach of the reciprocity between individuals towards the community and divine order. Europeans emphasized the moral of the individual mind, whereas the Inka focused on acts towards the community (Urton 2009, 820–821, note 7). *Kuachi*, “sin, fault, transgression,” is the concept for offence towards the *nu ñu ‘un* “the face of the Earth” or “the place of the Earth,” which is likened to saints—they have Christian names—or *ndiosi* among the contemporary Mixtecs in Santiago Nuyoo. For misconduct (*kuachi*) against this divine order there is punishment, although not necessarily towards the individual transgressor but the community at large by making people sick. There is consequently a moral principle of collective accountability (Monaghan 1995, 99–104, note 8).

Individual “sin,” “repentance,” “conversion” and “salvation” are simply not moral principles in American Indigenous philosophical systems. The Quechua category *hucha* refers originally to “debt” or “obligation” concerning the reciprocity between social groups or individuals and a *huaca* (an Andean divinity manifested by various objects in the natural world), where a ritual transgression had mundane consequences of misfortune. Contemporaneous Spanish observers claimed that Indigenous peoples of the Andes “confessed” their *hucha* to religious specialists (“confessors”) who ordered various forms of “penance” (Harrison 1992, 13–14, 2002, 270; Urton 2009, 816, 818–823). Durston asserts that these were divination rituals. There was no Andean concept of “sin” where an individual voluntary action polluted the soul and had to be purified. The Andean notion of *hucha* referred to social groups and not individuals, indicated by the em-

⁷⁵Harrison (2002, 270). Cf. Harrison (1992, 1993, 1994, 2014).

ployment of the same confessional *kipu* by various people (Durston 2007, 211, 287). The pre-Hispanic/pre-Christian *hucha* was an Andean (Inka) moral concept given a new and quite different religious (Christian) meaning by the missionaries.

Indigenous religions are communitarian whereas the salvation religions focus upon the individual. These moral philosophical systems contain a covenant between the community and the sacred order and are accordingly not perceived as a personal relation. There is no concept for “salvation” and no doctrines of heresies since an abstract theology is not needed where religion constitutes a communal experience. It is the participation in the community that is judged and not “sins” leading to a transcendental world post mortem. Individualism does not have a pivotal role in Indigenous moral philosophy/religion. Instead there is an interdependence of individual and collective identity. There is no Indigenous mission, claiming a divine truth. Accordingly, it is not possible to convert to an Indigenous religion by accepting its religious principles. The individual must be born into the family, clan and community, participate in the ceremonies and follow the customs and religious duties (Deloria 2003, 194–195). Consequently there are quite different concepts for “sin” or moral transgression in Christian theology and Indigenous religions. In the latter moral philosophy there is no eschatological doctrine of a transcendent post mortem existence where there is either an eternal punishment or eternal reward—that is, a soteriology.

The literal meaning of *tlatlacolli* in Nahuatl comprises a metaphor, as it conveys an image of something being damaged or corrupted. Hence there is no distinction between a moral cause and effect relation in using Nahuatl to translate Christian doctrinal categories (Burkhart 1989, 32–33). Disregarding the different literal and metaphorical semantics of “sin,” I hypothesize that this is also the case for similar categories in other Indigenous moral-linguistic systems. But moral misbehavior in American Indigenous cultures has consequences, although these have nothing to do with eternal damnation in an afterlife but instead concern the human existence and condition in the natural world. This also applies to Indigenous peoples outside the American continent where the effect of moral transgression or failure, for example with the Nuer, is physical sickness or various other diseases. This is because the spiritual condition is polluted, made unclean or contaminated (Evans-Pritchard 1967, 191–192, 195). A. Irving Hallow undertook an investigation of the relation of “sin” with sex and sickness among the hunting people Berens River Saulteux of Ojibwa decent living east of Lake Winnipeg in North America. For the people of Berens River Saulteux sickness derives from various types of transgressions.⁷⁶ As has already been established, in the Mixtec community of Santiago Nuyoo, *kuachi* is rendered as “sin, fault, transgression”

⁷⁶Hallowell (1939, 191). Ironically, the group that Hallowell examined, were supposedly “Christianized and less aboriginal” (note 1).

(Monaghan 1995, 103), but not according to Christian morality. Offending the earth deities *nu ñu 'un* (“the face of the Earth” or “the place of Earth”) is considered to be a *kuachi* (Monaghan 1995, 97, 99, 103–104). “Complain” can be translated with *ka 'a kuachi*, “speak fault” as for instance to the rain deities *ñu 'un savi* (Monaghan 1995, 114, note 13). The punishment for transgressions against the *nu ñu 'un* is that they make the offender sick. Thus they are often defined to be “an illness in the ground.” Illness is associated with fault and blame. The individual and/or his/her family is punished and made ill through the loss of *ánima* (animating life force) (Monaghan 1995, 97, 99, 103–104). As already note, the retaliation from the *nu ñu 'un* is not automatically directed towards an individual offender, but rather to another member of the household (Monaghan 1995, 103–104, note 8). For instance, not to share food with other people is considered a moral failure, a crime or injustice (*kuachi*) and will be punished as it is told in stories where the solar deity (i. e. Jesus Christ) who is said to punish people in this world (Monaghan 1995, 47). Ethical values represent knowledge of punishment and reward in this life and not post mortem for Indigenous peoples of the Americas. It is ceremony, which restores the natural world to perfection, as there is no need for Christ’s sacrifice to redeem humanity (Kidwell, Noley, and Tinker 2001, 107). There are accordingly healing deities, in ceremonies, and not saviors (Kidwell, Noley, and Tinker 2001, 75). Moreover, there is no praise but thankfulness in worship, because of a collective or communitarian, and not individual, reciprocal relationship with the divine order (Kidwell, Noley, and Tinker 2001, 56).

From this I deduce that concepts that have been translated as “sin” in the languages of non-soteriological religions should rather be translated with “crime,” “transgression,” “wrongdoing” or “offence”—depending upon the linguistic context.⁷⁷ The concept of “sin” in Christian moral doctrine belongs to a dual ontology where it is intimately associated with individual salvation and perdition.⁷⁸ Indigenous non-dualistic moral systems do not contain the concept of an individual soteriology related to a metaphysical or transcendental world but are focused upon the community in the natural (e. g. social or mundane) world.

⁷⁷Cf. Gruzinski (1989) about the Indigenous peoples of Mexico interpretations and practices of the various Catholic “sins” in the colonial period.

⁷⁸In certain Christian denominations a healing in this world can be theologically emphasized sometimes at the cost of a theology of (transcendal) salvation. For example, among Pentecostal churches in Brazil sickness, intimately associated with the condition of poverty, is the result of “sin” in the mundane world where also the cure of sickness is sought, according to Andrew Chesnut’s study (1997).

(Post) Colonial Anti-knowledge: The Doctrine of Discovery

From the late fifteenth century, the European “discovery” of continents and various cultures had a profound moral philosophical and religious impact upon European and non-European epistemologies. From the early colonial and continuing into the present postcolonial period, there is European moral-epistemological imperialism, through mission of Christian doctrine, upon Indigenous peoples.

European war, conquest and subsequent colonization of the continent later denominated as “America” from the beginning of the sixteenth century constitutes the political, social, economic, moral, philosophical and religious background for a principle ethical debate about the human dignity and human rights of Indigenous non-European and non-Christian peoples. The Council at Valladolid in Spain or Castilla (1550–1551) was originally about economic interests and the claiming of territory during the initiating phase of the colonization of the Americas. The King of Spain and the Catholic Church wanted to control the authority of the “encomenderos” in Spanish America. Christian religion, natural law and natural *dominium* were, in this context, fundamentally interrelated moral concepts during the disputation at Valladolid. The inalienable right to *dominium rerum* or property could only apply to rational human beings created in the image of God (*imago dei*) according to Thomistic Humanist natural-law principles of the relations between human beings and nations. At the Council of Valladolid it was accordingly disputed whether Native Americans were capable of self-determination over territory. In opposition to Francisco de Vitoria/Victoria (1483–1546) and at the Council at Valladolid against Bartolomé de Las Casas (1484–1566), Juan Ginés de Sepúlveda (1489–1573) argued that Indigenous peoples lacked civilization (civil society), violating and abusing the laws of nature and therefore did not enjoy this fundamental right.⁷⁹

The theoretical position of Sepúlveda disclaiming the right of Indigenous peoples to self-determination prevailed in the colonial and contemporary (post-colonial) periods through a judicial-theological “Doctrine of Discovery.” Papal Bulls of the fifteenth and sixteenth centuries aka “Doctrine of Discovery” gave Christian explorers the “right” to claim territories they “discovered” and lay claim to those lands for “discovering” Christian nation-states.⁸⁰ Any land that was not inhabited (*terra nullius*) by Christians, that is, devoid of human beings, was

⁷⁹Cf. Kirkhusmo Pharo (2014).

⁸⁰The Doctrine of Discovery constitutes the following series of Papal Bulls from the mid-1400s: Papal Bull Dum Diversas (18 June 1452); The Bull Romanus Pontifex (8 January 1454); The Bull Inter Caetera (4 May 1493). Expansions of the principle of Doctrine of Discovery in the Bulls are outlined in: the Treaty of Tordesillas (7 June, 1494); the Patent Granted by King Henry VII to John Cabot and his Sons (5 March 1496); The Requerimiento (1512). Cf. Davenport (1917) and <http://www.doctrineofdiscovery.org>.

available to be “discovered,” asserted and exploited.⁸¹ This judicial-theological doctrine, which embodied a moral-soteriological knowledge system, claimed *imperium*, *dominium* and slavery of Muslims and so-called “heathen” peoples in Africa, Asia, and America. The Papal Bull *The Bull Inter Caetera* (May 4, 1493) of Pope Alexander VI⁸² illustrates the North Atlantic powers imposition of imperialistic moral epistemology:

[...] the Catholic faith and the Christian religion be exalted and be everywhere increased and spread, that the health of souls be cared for and that barbarous nations be overthrown and brought to the faith itself [...] you have purposed with the favor of divine clemency to bring under your sway the said mainlands and islands with their residents and inhabitants and to bring them to the Catholic faith. [...] by the authority of Almighty God conferred upon us in blessed Peter and of the vicarship of Jesus Christ, which we hold on earth, do by tenor of these presents, should any of said islands have been found by your envoys and captains, give, grant, and assign to you and your heirs and successors, kings of Castile and Leon, forever, together with all their dominions, cities, camps, places, and villages, and all rights, jurisdictions, and appurtenances, all islands and mainlands found and to be found, discovered and to be discovered towards the west and south [...]

The so-called “ethical principle” of “just war” or a military “sovereign right” to occupy Indigenous land was upheld through the “Requerimiento” of Latin America (1512) and later in “Manifest Destiny” in North America from the middle and latter part of the nineteenth century. Manifest destiny was conceived as an ideology of “divine sanction” legitimizing the US’s expanding its territory over the whole of North America in order to extend and enhance its political, social, cultural, and economic and eventually linguistic influences. Applying principles of the Doctrine of (Christian) Discovery, this led to the process of dispossession of territories and self-determination of Indigenous peoples of North America.⁸³ Virginia Garrard-Burnett made a succinct categorization of the early Protestant mission from North America as “spiritual manifest destiny” (Garrard-Burnett 1990). The same can be contended about the previous colonial Spanish Catholic missionary inter-linguistic transference of moral philosophy.

The colonial Christian discovery doctrine is still a concept of public international law in various countries of the Americas and also in many other coun-

⁸¹ Cf. Miller (2008); Newcomb (2008). Cf. <http://www.doctrineofdiscovery.org>.

⁸² Cf. Newcomb (2008).

⁸³ Cf. Miller (2008).

tries outside this continent.⁸⁴ The judicial principle was originally expounded by the United States Supreme Court in a series of decisions, from the (postcolonial) precedence of “rights of discovery” and “ultimate dominion” in *Johnson v. M’Intosh* in 1823. The doctrine was Chief Justice John Marshall’s explanation of the way in which colonial powers laid claim to newly discovered lands during the Age of Discovery. Under it, title to newly discovered lands lay with the government whose subjects discovered new territory. The doctrine has been primarily used to uphold decisions invalidating or ignoring so-called “inferior” autochthonous rights to land in favor of colonial or postcolonial authorities. Today this doctrine governs US Indian Law.⁸⁵ but it has also had an impact on (post) colonial Latin America.⁸⁶

There is a correspondence between the ethnic-religious moral conception argued by Sepúlveda (partly by Las Casas) and the judicial-theological Doctrine of Discovery debasing non-Christian Indigenous peoples by not acknowledging their right to territory and self-determination. The European unawareness or obscurantism, that is, anti-knowledge and disrespect for Indigenous intellectual and moral systems are intimately related to the issue of Indigenous self-determination today.⁸⁷ The North Atlantic epistemological morality of the Doctrine of Discovery has an enduring impact that persist in the policies of national governments and court systems against Indigenous peoples in the contemporary (postcolonial) period.

Indigenous Concepts of “Morality” and Epistemology of the Natural World

Moral categories and imperatives affect the conception, production, practice and exploitation (instrumentality) of knowledge in general. Various domains of epistemology are accordingly intimately interrelated, not disjointed, in moral philosophies. Moral epistemology is therefore exceedingly significant because it determines other categories of knowledge—not only of the human and social but also the natural world.

In the colonial period, Catholic missionaries did not only evangelize the gospel but also the European economical system in Latin America according to

⁸⁴Cf. Miller (2008).

⁸⁵Miller (2008); Newcomb (2008). Cf. <http://www.doctrineofdiscovery.org>.

⁸⁶Cf. Miller, Lesage, and López Escarcena (2010); Miller and D’Angelis (2011).

⁸⁷The importance of these Papal Bulls, which started to become influential in Early Modern Europe (the beginning of European global colonization), is manifested by: “Discussion on the special theme for the year (May 7–18, 2012) at *The United Nations Permanent Forum on Indigenous Issues (UNPFII)*: “The Doctrine of Discovery: its enduring impact on indigenous peoples and the right to redress for past conquests (articles 28 and 37 of the United Nations Declaration on the Rights of Indigenous Peoples).”

Anthony Pagden. They connected mission with commerce, trade and business. Judicial-theologians advocated that the right to do business justified European expansion, “just war” and conquest because it was part of “natural law.” Moreover, they asserted that trade meant an exchange of moral epistemology between rational human beings, which created a consensus of what was ethically right or wrong. In this way, Indigenous peoples would be integrated into the order of international law.⁸⁸

The North Atlantic Doctrine of Discovery opposes Indigenous ecological-moral conceptual knowledge because of its radical dichotomy between human and natural beings. The Christian principle of a human moral supremacy over other beings of nature, as outlined in Doctrine of Discovery, is inspired by Genesis 1: 26–29 of the Old Testament according to Steven T. Newcomb:

Then God said, “Let us make humankind in our image, according to our likeness; and let them have dominion over the fish of the sea, and over the birds of the air, and over the cattle, and over all the wild animals of the earth, and over every creeping thing that creeps upon the earth.” So God created humankind in his image, in the image of God he created them; male and female he created them. God blessed them, and God said to them, “Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth.”⁸⁹

In Indigenous American ecological ethics there is no such divine moral principle legitimizing an exploitation of nature to the exclusive benefit of human beings.⁹⁰ This can be linguistically substantiated in Burkhart’s hypothesis of a non-Christian religious and philosophical moral significance of *tlatlacolli*, which implies a “damage” of the Nahua cosmic (i. e. natural) order. *Tlatlacolli* relates to transgressions or misdeeds towards deities or not fulfilling religious obligation—a damage or violation of the sacred order as an effect not as a cause in the Nahua moral system, disrupting not only the individual being, but also society and the world order (Burkhart 1989, 29). According to Nahua philosophy there was a constant anxiety that the world would fall into chaos, from a state of structure/order into anti-structure/disorder which radically oppose the Christian theological

⁸⁸Pagden (1982, 76–77); cf. Harrison (2014, 151–185).

⁸⁹Newcomb (2008). Cf.: “Ask of me, and I will make the nations your heritage, and the ends of the earth your possession” (Psalms 2: 8).

⁹⁰A linguistic comparative analysis of Indigenous non-Linnaean and non-Darwinian taxonomies of the natural world could be productive. The natural properties of categories of animals, birds, fish, trees, herbs, flowers, metals, and stones, and about colors” are for instance outlined in Nahuatl in “Earthly Things” (Book 11) of the Florentine Codex.

concept of “sin” as associated with the dualism of good vs. evil (Burkhart 1989, 34–39). Crime and misdeeds for the present-day Nahua constitute an imbalance for the interrelated socio-political and religious (moral) order (John Sullivan pc, 16 November 2010) of the social and natural world. If Burkhart’s theory is correct, *tlatlacolli* was one of the core concepts in the moral system of the Nahua. Ecological sins are indeed pivotal in Andean moral philosophy (Harrison 1993, 177–178). As aforementioned there is an antonym concept to “sin” (*hucha*)—or misbehavior, transgression; antisocial, antistructure, failure to fulfill (ritual) obligations of reciprocity towards community and deities. This is *cama* with the meaning of “task,” “order,” “creation” (“structure”), and “responsibility.”⁹¹ There is accordingly a conflicting dichotomy (disjunction) in this moral philosophy: order, structure, and creation as opposed to disorder, anti-structure and destruction. This complementary opposition is mediated by confession and penance and expiation—in a religious political economy of a credit and debit system and Indigenous moral philosophical systems and practices.⁹² Conversely, Christian theology operates with a moral dualism of good, Christ, grace, salvation opposing evil, devil, and sin (Urton 2009, 823). Like Nahuatl *tlatlacolli* Quechua/Aymara *hucha* has moral implications for the relation between human beings of the social world with the natural world.

Indigenous language systems contain various linguistic categories for morality not affiliated with European philosophy and religion. The (Christian) non-doctrinal *Florentine Codex* categorizes various vices and virtues of peoples of different status and professions with either good (*qualli*) or bad (*amo qualli*; *tlahueliloc*) moral qualities in book 10 (Sahagún 1950–1982 [1565])—a chapter is dedicated to “bad” or “evil” peoples (Sahagún 1950–1982 [1565], 37–39, 55–57). *Tlahuelliloc*, *tlaueliloc* signify “perverse,” “bad.”⁹³ *Tlahueliloca* is “someone malicious, a villain or rogue” (Karttunen 1992, 269). Besides the non-doctrinal *Florentine Codex*, the Nahua chronicler Don Domingo de San Antón Muñón Chimalpahin Quauhtlehuanitzin writes: *Auh ca cenca huey nahualle amo mach iuhqui yn inan yn itoca Mallinalxoch. ca cenca huey tlahuelliloc yn copil*, “He was exceedingly wicked and a very great nahualli. Copil was not the equal of his mother, Malinalxoch by name, but [nonetheless] was exceedingly wicked” (Chimalpahin Quauhtlehuanitzin 1997, 86–87).⁹⁴ Conversely, Book 3 of *Florentine Codex* requires that the religious specialists of Quetzalcoatl do not need to be born of a certain lineage but required to lead a good, righteous life, and

⁹¹Durston (2007, 215, 238); Urton (2009, 816, 821–823); cf. Harrison (2014).

⁹²Cf. Urton (2009).

⁹³*Tlahueliloc*. maluado, o vellaco, Molina (1977 [1555 and 1571], 144r); *tlahuelli*, rage, fury, indignation, Karttunen (1992, 269).

⁹⁴Cf. Nahuatl Dictionary. Wired Humanities Project. <http://whp.uoregon.edu/dictionaries/nahuatl/index.lasso>.

be of a compassionate, pure and good heart (Sahagún 1950–1982 [1565], 67–68). This is also stated in book 6, which outlines moral philosophy and rhetoric (Sahagún 1969, 114). Book 6 of the *Florentine Codex* and the didactic oratorical moral scriptures known as *Huehuetlahtolli*. *Testimonios de la Antigua palabra* [1600] (“words of the elders”; “ancient discourse”; “testimonies of the ancient word”)—also called *tenonotzaliztli*, which signifies “admonishments” or “exhortations”—outlines the moral philosophical knowledge and practice of Nahua society.⁹⁵ Taken from the Nahua pictorial-logographic manuscripts, the *huehuetlahtolli* teach conduct, self-control, respect and tolerance. Moreover, there is a call for moderate behavior, humility, generosity, courtesy and avoidance of excess and passion (Sahagún 1950–1982 [1565]; León-Portilla and Silva Galeana 1988; 1990, 30–32; Baudot 1995, 225–234).⁹⁶ But moral awareness was also outlined in other contexts. For instance, the moral qualities and knowledge of the lord whom shall govern are stated in Book 8 (“Kings and Lords”) of the *Florentine Codex* as: *in mjmatinj, in mozcalianj, in tlamtinj, in qualli ictli inezcaliliz, inneoapaoaliz, in vellatoa, in vellacaquj, in tetlaçotlanj, in jxe in iollo*; “the prudent, able, wise; of sound and righteous rearing and upbringing; who spoke well and were obedient, benevolent, discreet, and intelligent” (Sahagún VIII, 61).

As opposed to *hucha*, the term *cama*, reflecting “order,” “structure” or simply connoting “anti-transgression” may be translated as a Quechua/Aymara abstract category for “morality.” Likewise for the Nahua: in quite a few manuscripts of the early colonial period the Nahuatl concepts *cualli*, “good” and *yēctli*, “just” (León-Portilla and Silva Galeana 1988, 54–55; Launey 1992) can in certain contexts be translated with “morality.”⁹⁷ The ML usurped this category. In Franciscan sermons of the sixteenth century, the expression *cualli yectli, acualli ayectlli* (“the good/proper, the bad/impure”) in different linguistic variants gave the moral idea of “good”; “pure,” originally used by the Nahua *tlamatini* (“wise person,” “sage,” “scholar”)⁹⁸ before the Europeans arrival (Sahagún 1950–1982 [1565], X, 48; Klaus 1999, 104–105). *Cualli* signifies “good” whereas *yectli* can liter-

⁹⁵ *Tenonotzaliztli in tetta yc quinonotza, yc quizcalia in ipiltzin inic qualli, yectli yc monemitiz*. “Exhortación con que el padre así habla, así instruye a su hijo para que bine, rectamente viva,” León-Portilla and Silva Galeana (1988, 275–309).

⁹⁶ Cf. the “dialogue” that purportedly took place between twelve Franciscans and Mexica aristocrats and philosophers (*tlamatinime*) in 1524. It was found and edited by Sahagún in 1564 as *Coloquios y doctrina Christina con que los doce frailes de San Francisco enviados por el papa Adriano Sexto y por el Emperador Carlos Quinto convirtieron a los Indios de la Nueva España. En lengua Mexicana y Española*, Duverger (1987); Klor de Alva (1980); Sahagún (1986 [1564]).

⁹⁷ *Yēctli*, something good, pure, cleans according to Molina, Karttunen (1992, 338). *Yectli* y *yullo*, virtuous and with good morals, Molina (1977 [1555 and 1571], 35r) and *qualli yullo*, *hombre de buen corazon sincero y sin doblez, o hombre sancto*, Molina (1977 [1555 and 1571], 84v).

⁹⁸ Cf. Karttunen (1992, 281). *Mati*, “to know something,” Karttunen (1992, 138) and *tlamatiliztli*, “knowledge,” Molina (1977 [1555 and 1571], 126r).

ally be translated as “something finished or completed” according to J. Richard Andrews. Abstract derivatives of these nouns are *cualiztli* and *yectiliztli* “goodness” or *acualiztli* and *ayectiliztli*, “badness.”⁹⁹ Furthermore, *qualli* and *yēctli* are recorded with the meaning “good” in the supposedly non-doctrinal grammar (*Arte*) by ML Horacio Carochi.¹⁰⁰ He records, albeit in a Christian frame of reference, people as being “good” with the collocation *in qualtin in yectin* (Carochi 2001 [1645], 400–401, 109–109v), but which may well have been a pre-Christian concept.¹⁰¹ On the other hand, the formula *qualli tlacatl telpocatzin*, “a good or virtuous person” appears in a non-religious context (Carochi 2001 [1645], 412–413, 112v–113, cf. note 3). Carochi observes moreover, that the inchoative verbs *qualti* and *yēcti*, “to become good,” can take the grammatical form *qualtilia* and *yēctilia*, “to restore or fix what is damaged, make it good” (Carochi 2001 [1645], 222–223, 57v, 59v–60, 230–231). The translation of these moral concepts as “to restore or fix something that is damaged” can be conceived as directly opposing moral corruption of “sin” or *tlatlacolli*, which signify “something damaged.” This may well also apply to *tlapilchihualli* or *tlapilchializtli*, which means to “make something wither or deflate.” Both these Nahuatl concepts indicate moral deficiency. It seems that *cualli* and *yēctli* outline moral order combatting evil and disorder (anti-structure). This conceptualization of principled epistemology further implies that the Nahua have a meta-category for virtuous thinking and practice, e. g. “morality.”

Indigenous American moral knowledge is undeniably expressed by their various linguistic-philosophical categories—not influenced by European Christianity or philosophy. In addition, conscientious linguistic categories for the conception “morality” exist in Indigenous languages of the Americas. Further systematic research is required, however, on key and core ethical concepts and ideas from Indigenous American languages and epistemologies that structure their moral philosophical systems and practices. This may well have an impact beyond inconsequential moral philosophical and linguistic investigation. As has been propounded, the inter-linguistic transfer of moral knowledge is intimately connected with epistemologies of business and natural sciences. As moral philosophies are interrelated with systems of religion and

⁹⁹Burkhardt (1989, 38–39). *Qualli* and *yectli* cf. Carochi (2001 [1645], 222–223, 57v, 230–231, 59v–60).

¹⁰⁰For words for “sin” and “virtue” in colonial Yucatec cf. Schrader-Kniffki and Yannakakis (2014) and Yannakakis (2014).

¹⁰¹“Someone is considering taking a youth as a son-in-law and says of him, *Ca icnotlacatl, atle iaxca itlatqui, tel qualli tlacatl, or yece qualli tlacatl*. He is poor, but a good person,” Carochi (2001 [1645], 430–431, 117v–118); *In qualtin in yectin pactinemí, yocoxca nemi, àcampa nacazmahui, tlacacco nemi*, “The good live happily, they have no fears or shocks, they live in great peace and quietude,” Carochi (2001 [1645], 440–441, 120–120v). Fray Andres de Olmos records *cualtin* as “they who are good,” Olmos (1875 [1547], 18).

socio-political institutions and organizations of a culture or society it does indeed contribute to how nature and its resources are used, exploited and even transformed. Beginning under European colonial domination—that is, introducing the present (proto-)Anthropocene or human-influenced, or anthropogenic epoch¹⁰²—human-nature-interactions exhibit the long-term consequences of human interference and the impact of human ethics, behavior and cultural practices. The colonial period of moral knowledge production, organization and systematization and the related socio-political processes and institutions accordingly instigated the contemporary significant global impact on ecosystems and climate. Indigenous moral epistemologies of long term rationality and universal value for every organism, specie and being of the natural world may contribute to generate sustainable human-nature-interactions.

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¹⁰²Cf. Wendt, chapter 11 in this volume.

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Chapter 4

Issues of Best Historiographical Practice: Garcia da Orta's *Colóquios dos simples e drogas e cousas medicinais da India* (Goa, 1563) and Their Conflicting Interpretation

Sonja Brentjes

Garcia da Orta (d. 1568), until the 1930s mostly known among botanists and a small group of Portuguese academics, has since become something akin to a cult icon for historians and historians of science interested in a broad variety of issues.¹ These issues include scientific and medical progress, the Portuguese colonial empire, the Inquisition, cross-cultural exchange of knowledge and ethnobotany, to name the themes most often presented. Orta has been hailed as the first European writer on Asian medicinal plants and simple drugs, as well as the first natural historian who privileged observation and experiment over books and thus brought on progress. He has been presented as the first ethnobotanist, as someone, who rejected the “Arabs” and “Brahmanic” medical teaching, while relying predominantly on local “empirical epistemology” brought to him by his “Konkani” slave,

¹ Given the methodological and technical problems that impact the interpretation of Orta's work, life and identities, I wish to state clearly that I approached Orta's book and the secondary literature written about it as an outsider to the debate. I do not claim to be or to have become an expert of Portuguese India, the Portuguese Inquisition and medical practices in western India between Diu and Kochi, or Goa and Ahmadnagar, nor am I an expert on the entirety of Indian languages referred to by Orta. My expertise lies within the history of science for Islamicate societies, with a focus on Egypt and western Asia, but also includes some basic knowledge of Islamicate societies in India and Central Asia. Moreover while at university I took classes in both Sanskrit and Indian history. Although this linguistic knowledge of Sanskrit, since never used, has diminished considerably by now, it still enables me to do some elementary groundwork with respect to the botanical and pharmaceutical names presented by Orta in addition to Arabic, Persian, Malay and the occasional Turkish and Ethiopian in languages that he called Gujarati, Bengali, Deccani, Canarin and Malabar. I read Orta's Portuguese text with great effort and a dictionary, based on my knowledge of Latin, French and some Spanish, and in comparison with the recent French and the older, at times problematic English translations. Occasionally I asked colleagues for help. Endowed with this certainly insufficient set of elementary skills, I will describe some of my observations and results, which I achieved by cautiously applying simple methods such as counting frequencies of medical prescriptions or botanical names, checking foreign words and expressions in dictionaries and grammars, controlling dates, inquiring about the distribution and properties of local Indian languages, registering silences and absences, or comparing the structural features of Inquisitorial testimonies as described by Cunha and analyzed by Saraiva with properties of Orta's exposition.

Antónia. A third position views him as a representative of centuries-old Jewish social mobility and cooperation with the ruling Christian military elites on the Iberian Peninsula. An anthropologist describes him as a free spirit who cherished male and female bodies and their sexuality, multicultural cooperation and equality, as well as the free flow of ideas and goods. He also has been seen as an eclectic writer and a bad doctor.²

In this paper, I approach the Portuguese physician's book and personality as represented in it from the perspective of a historian of science specialized in Islamic societies. I ask what this perspective may change in our perception of the work and the man. I will argue that focusing on Orta's book as a product of his Iberian scholarly and religious identities prevents us from understanding its entanglement with local practices embedded in different intellectual, political, religious, cultural, dietary and healing traditions and moral economies. Exploring catalogues of Persian medical manuscripts as a case for this argument I show that there is material with close affinity to Orta's book available from the sultanates that Orta visited. Using modern dictionaries of languages spoken and/or written in western India during the sixteenth century for analyzing Orta's multilingual botanical and medical terminology in comparison to his own statements about his language acquisition and proficiency, I offer arguments for their narrow limits and origins in the market sphere rather than the scholarly environment. A further methodological argument which I raise concerns Orta's narrative strategies. Applying simple methods, I suggest that the properties of Orta's text highlighted by other historians isolate expressions and emphases relevant to our own scholarly concerns and values. A comprehensive investigation of the narrative features and the semantic fields of privileged terms and phrases reveals, however, their link to forms of arguing, narrating, and thus evaluating things, people and knowledge much more in tune with Orta's own times and the literature he studied at Spanish universities. Such an investigation also yields the surprising discovery that Orta intentionally painted an irenic image of his time, military campaigns and life in Goa and beyond. For this purpose he constructed a bricolage of events violating their chronology and of knowledge practices in conflict with those that a study of western Indian material offers to us. Hence, the thread linking the different parts of my paper is a discussion of historiographical approaches to the study of Orta and his book by historians of science and medicine, students of Judaism and representatives of other academic fields contributing to this research.

I start with a discussion in two sections on when and why Orta possibly compiled his *Colloquies* and whom he might have addressed. In the third and fourth sections (p. 100), I discuss new approaches to the study of this book as published

²See Roddis (1931); Boxer (1963); Fischel (1974); Mathew (1997); Grove (1991); Pearson (2001); Cook (2007); Županov (2002, 2009, 2010); Costa and T. Carvalho (2013); Pimentel and Soler (2014).

by Palmira Fontes da Costa in 2015. The fifth section (p. 104) offers information about Persian doctors at the Nizam Shahi court, who so far no modern researcher tried to identify, although Orta's visits in Ahmadnagar are a prominent feature of his narrative. The sixth section (p. 105) deals with methodological issues posed by approaches to Inquisition studies and their impact on studies on Orta and his work. In sections seven and eight (p. 107), I discuss general historiographical problems contained in studies of the *Colloquies*. In the second half of this paper, encompassing sections nine to seventeen (p. 111–133), I present my views on the structure, programmatics, narrative strategies and mistakes of Orta's book and discuss the character and quality of his advertised language skills as well as his cross-cultural outlook. The final section contains my conclusions about the state of the art and how to proceed in future.

When Did Orta Write His Book?

For various issues related to Orta's *Colóquios*, an effort to determine its possible date *post quem* would be very helpful. To achieve this is no easy task since Orta claims in his book's dedication to his benefactor Sousa that he "could very well have composed the treatise in Latin" adding "as I had composed it many years before" (Orta 1891, 5; Pimentel and Soler 2014, 109; Iken 2009, 78). Dimas Bosque modifies this claim in his letter to the reader at the beginning of Orta's book by saying that his colleague had first started out to write it in Latin, before choosing Portuguese in order to be closer to his subject matter and to allow his friends and acquaintances to profit from his work (Orta 1891, 11). The Portuguese text contains only a few Latinisms, none of which are strong enough to make this claim irrefutable (Iken 2009, 84–85). Thus, it could well be one of Orta's numerous rhetorical strategies to remind his readers of his status as a well-educated, well-connected doctor. Iken pointed out several purely linguistic choices that contribute to precisely this end (Iken 2009, 79–80, 85–87). The datable references in Orta's text concern mostly the early years of his stay in Portuguese India: Bahadur Shah died in 1537; Sousa's military campaigns took place between 1534 and 1538; he returned as governor in 1542 and left in 1545; Miguel Vaz Coutinho died in 1547; Francis Xavier died in 1552, but was in Goa only in 1542 and 1548–1549; Burhan al-Din Nizam Shah died in 1553.

Orta mentions with pride and satisfaction a lease he had received, in the name of the king, in Mumbai and its island (Orta 1891, 326; 1913, 193).³ There are different opinions as to when and for how long he was in possession of it. Fischel believes that the viceroy João da Castro accorded it to him in 1548. He

³Mumbai is situated, however,—at least today—on a peninsula.

speculates that the lease ran out in 1554, but provides neither argument nor evidence (Fischel 1974, 417). Markham, the translator of Orta's book into English, claims, also without evidence, that it was the later viceroy Pedro de Mascarenhas (1554–1555) who granted the lease (Orta 1913, ix). Orta describes the lease as “long-term” (Orta 1891, 326; 1913, 193).

Two other references are more difficult to date, but point to a period in the 1550s: the treatment of Burhan al-Din Nizam Shah's heir designate, when he was about 30 years of age and Orta's presence in Junnar, the first capital of the Nizam Shahi dynasty, while Burhan al-Din was still alive and his sons were still with him. Shyam, in his history of Ahmadnagar, based on local historians of the sixteenth century, reports only two withdrawals to Junnar during Orta's life in India: that of Burhan al-Din in 1528, which is obviously too early for a visit by Orta and that of Burhan's son Husayn Nizam Shah (d. 1565) in 1558 (Shyam 1966, 114). The latter visit is possible, since Husayn Nizam Shah also had several sons (four). But it would mean that Orta used the dynastic designation as well as the name of honor (*laqab*) indiscriminately for both rulers without specifying them otherwise. Orta's references to Nizam Shah and Nizam al-Mulk until the very end of his book seem to support such a reading of his practice (Orta 1895, 306, 332, 343, 364, 388, 390). A visit in Junnar in 1558 would also mean that Orta traveled to the sultanate in times of intense warfare.

As for Orta's treatment of a thirty-year-old crown prince, this must have been Husayn Nizam Shah, since his father appointed him heir designate some time after 1534 when the whole family except one son (‘Abd al-Qadir) converted to Shi‘ism (Shyam 1966, 81). ‘Abd al-Qadir, previously Burhan al-Din's favorite, had to leave court and city. But when did Husayn turn 30? This is not easy to determine, because neither Shyam nor those of his sources I could check give the man's age at his death nor do they provide information when Burhan al-Din married Husayn's mother Amina, a dancing girl. All that is known is that he did so some time before 1523, when he was still very young, and that Amina gave birth to her third son between 1523 and 1526 (Shyam 1966, 66–67). This suggests that Husayn might have been born around 1520 or even a few years earlier, but probably not before 1515, since Burhan al-Din was seven or nine years old in 1510 (Shyam 1966, 61).

In chapter 54, in addition to the date of Orta's arrival in India, two further dates are given: 1539 and 1546. Both refer to two major sieges leveled by Ottoman and Gujarati forces against the Portuguese fortress on the island of Diu, which ended with Portuguese victories (Orta 1895, 339–340, 342; 1913, 442–443, 445). A relatively continuous reference to time intervals is to be found in Orta's little reports about Goa's governors and viceroys. Beginning with Sousa to Francisco Coutinho (1561–1564), he names six out of nine. Two are missing

for the period from 1548 to 1550 and one for the months from September 1554 until June 1555.

Early in his book, in chapter 12, Orta speaks of himself as being already of old age (Orta 1891, 87). Although I do not know what this might have precisely meant to Orta, he most likely did not mean to say that he started compiling a notebook immediately after his arrival in 1534, when he was about thirty-four years old. If we assume with some hesitation that of old age meant to be closer to sixty than to fifty, we find ourselves in the later 1550s.

Considering these various references and their location in time, it is possible that Orta began working on his book in the first half of the 1550s. He certainly did not finish all of it, since the parts referring to Dimas Bosque cannot have been composed before 1558/1559, the arrival of the Spanish physician in Goa and his participation in a campaign against Jafnapattam on Sri Lanka. Some historians speculate that it was Bosque who motivated Orta to compile his book (Walter 1963, 263). The fact, however, that the various events and names are not narrated chronologically, but are reported with regard to the alphabetically presented plants, drugs and diseases, makes any further conclusion about the period of writing impossible.

For Whom and Why Did Orta Write His Book?

In the dedication to Martim Afonso de Sousa and the letter to the reader, defending Orta's choice of Portuguese rather than Latin, Orta and Bosque claim that the author's goal had been to provide access to his knowledge and experience for "all who live in those Indian regions," in particular his family, friends and acquaintances in Goa (Orta 1891, 5, 11). This suggests that Orta's intended audience were the Portuguese inhabitants of Goa. Such an understanding of the introductory claims seems to be supported by the choice to print the work in Goa, even when the little print shop at the Jesuit College St. Paul and its two printers, a Portuguese (who is said to have been absent during the work) and a German, did not produce high-quality work. Bosque points explicitly to this shortcoming of the book in his letter (Orta 1891, 11). This decision involved asking the leading men in power, e. g. the viceroy Francisco Coutinho, the Inquisitor General Alexei Dias Falcão and the archbishop Gaspar Jorge de Leão Pereira (1558–1567, 1571–1576), for the privilege (viceroy), the Imprimatur (Falcão) and the permission to use the print shop of the Jesuit College (Pereira). Whatever suspicions the Inquisition might have harbored against Orta and his family in 1562, all three men approved of Orta's work and supported its publication as the second book printed in town. They obviously considered it a suitable enterprise for the physician and for Goa's inhabitants. Hence, Županov interprets Orta's choice of language and

place of printing as carefully made and the city's inhabitants as his intended audience (Županov 2002, 11).

The choice of Portuguese over Latin leaves no doubt, I believe, that Orta was not writing for the scholarly communities in Catholic and Protestant countries of Europe. His sharp attacks against leading medical and botanical authors of the sixteenth century, coupled with his remark that he could not write such a book in Spain, supports such an interpretation. But if Orta really meant to provide Portuguese inhabitants of Goa with easy access to medicinal plants and remedies, why did he not provide more detailed descriptions of how to produce the drugs and how to apply them? The title of the original print is much longer than the standard title given in twentieth-century bibliographies. It suggests that Orta intended to offer such information only for a limited number of cases: “Coloquios dos simples, e drogas he cousas mediçinais da India, e assi dalgũas frutas achadas nella onde se tratam algũas cousas tocantes a mediçinas, practica, e outras cousas boas, pera saber cõpostos pello Doutor garçia orta: [...]” (Orta 1891, title page).

His representation of people, events and his own person raises further doubts about what he had in mind when writing his book and whom he wrote it for. The men in power in Goa, along with Orta's family, friends and acquaintances were capable of perceiving all gaps and contradictions in both the text and Orta's self-representation. Even though I saw no reference to information sent by the Portuguese Inquisition to Goa, this does not mean that the men in power who approved of Orta's book were ill-informed about his family's bad experiences in Lisbon in 1547, the military conflicts with the rulers of Gujarat, Ahmadnagar, Golconda or Vijayanagara or the persecution of 35 women and men from Kochi and Goa in the years immediately before the introduction of the Inquisition to Goa. Orta's rhetorical strategies of irenic depiction of western India, promotion of Portugal, emphasis on high-ranking social connections, glorious self-representation as a successful and educated physician and silences of all kinds would not have convinced these men to correct their image of the Portuguese doctor and merchant. If Orta could not hope to change with these narrative forms the prevailing attitude among the Portuguese elite in Goa, did he mean to address through them the Portuguese court? Was Orta looking for additional patrons and hence stronger protection? Such questions cannot be answered without further investigations in Portuguese and Goan archives.

New Approaches to the Study of Orta's *Colloquies*

In late 2015, a newly edited book on Orta and his *Colloquies* appeared (Costa 2015). Among the twelve contributions, the most valuable one—in my view—comes from its editor. Under the header “Identity and the Construction of Mem-

ory in Representations of Garcia de Orta,” Costa discusses the various efforts to glorify Orta as the “founding father,” “the pioneer,” the “first European” writer on Asian drugs, a central rallying point for “national identity” and a hero (Costa 2015, 237–264). She emphasizes that many writers about the Portuguese physician and merchant represent the content of his book often literally and with uncritical admiration, leading to hyperbole and magnification, a situation made worse by a lack of historical knowledge and sophisticated methodology, compounded by the also otherwise widespread inclination of academics to repeat the mistakes and judgments of previous authors (Costa 2015, 264). Costa is one of the first writers about Orta who admits that such research and writing practices carry with them political, ideological and scientific legitimation strategies (Costa 2015, 255, 258). In the case of Orta, such value statements are closely linked to positions towards Portuguese colonialism, the Portuguese Inquisition, Catholicism and Judaism, scientific progress and the importance of ancient Greek, Islamic, Indian and modern Western contributions to the sciences and medicine (Costa 2015, 255–62). Understandably, she overlooks the very same tendencies in some of the papers included in her new book. But given the substantial shortcomings of previous papers and books on Orta along the lines described by Costa, her analysis as well as the book as a whole are an important step forward to a more balanced and reliable historical evaluation of the man and his work.

Costa’s article builds in its substance on positions on Orta’s book expressed in an earlier paper (Costa 2012). In contrast to other researchers, her views remain closely related to the structure, the emphasis, the locality and the language of Orta’s book. She recognizes Orta’s intense effort of self-representation, acknowledges his preference of medieval Arabic doctrines and pharmaceutical knowledge, points to the central role of Orta’s house in Goa for his ways of story-telling and discusses the different manners in which he talks about books (Costa 2012, 75–78). Her effort to include positions of other recent authors like Grove, Cook or Arrizabalaga in her report, without investigating the reliability or appropriateness of their interpretations, mar the overall outcome of her analysis (Costa 2012, 78).

The book newly edited by Costa continues her search for a more reliable, less ideologically distorted interpretation of Orta’s life and work. Accordingly, the group of academics invited to a conference in 2013 in Portugal was broadly construed, including historians of medicine, science, Portugal and her empire, Portuguese literature and culture, Asia, gender, as well as an anthropologist and a cultural historian. Thus, it does not come as a surprise that this new book broadens the array of previous perspectives and questions. Its authors pay particular attention to literary devices, food and smells, Portuguese historiography and the place of Orta in the world of the Indian Ocean (Županov, Castro, Arrizabalaga,

Pearson). Some even distance themselves from the previous progressivist reading of Orta's book and strongly suggest its contextualization within the Goan, as well as the Indian Ocean cultural spheres (Cagle, Pearson). In addition, there are comparisons with contemporary and later writings on *materia medica* elsewhere in Europe and the New World (Andrade, Egmond, Pardo). As a result, Orta's work is now read among historians of science and medicine in a more complex and variegated manner.

Visible Lacunas in Costa's Book

Despite Costa's broad choice of contributors, her book gravitates overwhelmingly toward matters related to Portugal, whether history, medicine, science, language or culture. Asia is represented only once in it. Absent are scholars working on issues that shaped the analysis of Orta's life and continue to act as givens: the Inquisition; early modern religious communities and cultures in western India, the Ottoman Empire (in particular Cairo), the Iberian Peninsula or the Low Countries; medicine, botany and languages in societies of western India. Hence, claims about these topics continue to essentialize Orta as a person for whom two identities alone explain most of his book, his claims about knowledge, relationships, events and objects, as well as his choices of language, authorities and models for self-representation: his identity as a scholar and the identity as a Jew attributed to him by the Inquisition and modern historians.

The consequence of such absences left its mark within the individual articles. A reader looks in vain for medical, botanical and historical primary sources from western India. Material from the Goan archive is underrepresented, if at all discussed. Although several authors use historical research texts on Goa, the Indian Ocean or history of medicine in Islamicate and other South Asian cultures, their texts indicate either an insufficient familiarity with local or regional conditions or an abstention from discussing the gaps in sources or evidence for Orta's reflections and claims. The reference to Pormann and Savage-Smith's survey on the history of medicine in Islamicate societies, for instance, contributes nothing to an understanding of the specific conditions in Goa, Ahmadnagar or Gujarat between 1534 and 1567 (Costa 2015, 123). Medieval physicians quoted by Orta like Ibn Sina or Abu Bakr al-Razi did not use the expression *yunani* medicine, which seems to have been coined only in the British Raj (Costa 2015, 78). Neither was this medical system created as a new school "when the Arabs conquered Persia" (Costa 2015, 78). The visit of Hindu physicians in Baghdad who translated Sanskrit medical texts into Arabic was exceptional, as far as we know and Muslim physicians did not study in the same time, that is, in the late eighth century, in India. When they later traveled to India their destinations were overwhelmingly

part of Muslim expansion in South Asia, and their goal was to profit from the growing opportunities for Muslim patronage (Costa 2015, 78).

The absence of expertise with regard to South Asian, Islamicate, Jewish or “converso” communities, societies and intellectual histories is also reflected in a number of false statements or evaluations in Costa’s book. They encompass misspellings of Arabic, Persian or Sanskrit names of people, religious or social groups and cities, the misidentification of the ethnic identity of the Nizam Shahi and the Ottoman dynasties, or the appropriation of Orta’s (false) geographical designation of unnamed physicians whom he allegedly met either in Gujarat or the Sultanate of Ahmadnagar.⁴ The acceptance at face-value of Orta’s identification of people, regions, distances, diseases, plants, foodstuff or names without cross-checking or contextualizing his “facts” is a repeated feature of writings by researchers specializing in different domains of European history when matters of India or her Islamicate neighbors are discussed. These modern mistakes highlight another problem, which undergirds studies of local knowledge cultures outside Europe by Europeanists. When Orta speaks, for instance, of physicians from “Persia, Turkey, and Arabia,” whom he pretends to have met at the court of the Nizam Shahi rulers, he speaks of the Ottoman and the Safavid Empires in the geographical languages of antiquity, as well as the Crusades, which shaped most of the written discourse of Catholic and Protestant Europe and of the world maps produced in Venice in the first half of the sixteenth century. The geographical languages of the portolan charts (fourteenth–seventeenth centuries), however, often differed through the makers’ usage of local names learned from merchants, foreign books and visual material (Brentjes 2012). Orta most likely will not have had access to the new maps of Asia produced by Giacomo Gastaldi (d. 1567) in 1559 and 1561 and their incorporation of localized names of regions and places (Brentjes 2013). Hence, when he talks of “Persia, Turkey, and Arabia” it is unclear whether he indeed talks of real people whose places of origin he could only identify within his own cultural frame or whether he instead translated the languages they used as medical experts into geographical markers of his own knowledge culture.

Furthermore, the focus on individual aspects of Orta’s book without paying serious attention to their relationship to any of the book’s other components, while understandable in the context of a conference, creates methodologically important obstacles. Unsurprisingly, several contributors to the volume disagree profoundly in the reading of Orta’s book. A conversation about the meaning of these conflicts of interpretation unfortunately does not take place (Costa 2015, 109–11, 128–30). Neither is there a debate about the veracity or reliability of Orta’s de-

⁴Costa (2015): p. 15 [Turkish sultans], p. 18 [Brahmanists], p. 25 [Nizam Shahis are Turcomans], p. 102 [Razhes, Buhran, Persian, Arab and Turkish physicians], p. 105 [Razhes].

pictions or claims. Although errors are discussed as a new and important theme, the focus is on Orta's attitudes towards errors and their different classes (Pimentel and Soler 2014). Orta's own, multiple errors, in contrast, are neither analyzed nor mentioned as a feature of his book. Their identification and analysis is, however, an important key to understanding Orta's modes of narration and representation, as well as of the reliability and soundness of his knowledge.

Persian Physicians at the Nizam Shahi Court

In order to know which physicians worked between 1534 and 1567 at the Nizam Shahi court, research of Persian, Arabic, Marathi and possibly other texts on history, medicine, *materia medica* and administration need to be included in the study of Orta's book. In some instances, such a search is easy to conduct. Keshavarz's catalogue of Persian manuscripts of the Wellcome Institute for the History of Medicine in London, for instance, mentions Rustam Jurjani, a Persian physician, who moved from Iran to India, arriving in 951/1544 in the Deccan, and translated and annotated in 954/1547 Ibn al-Baytar's (d. 646/1248) pharmacopeia of simple and compound medicines for Burhan al-Din Nizam Shah (r. 914–961/1508–1553), whom Orta visited repeatedly (Keshavarz 1986, 56, 274–5). A copy of this work is extant at the Wellcome Institute [Wellcome Pers. 217] and thus can be studied in comparison with Orta's book. Jurjani also wrote at least two other medical works in Arabic and Persian, one of them treating fevers. Its analysis can help to check Orta's surprising claims about how Muslim physicians treated feverish diseases in the realm of the Nizam Shahi and perhaps even those that Orta makes about Gujarati physicians. A further possibility to acquire a more precise understanding about medical practices among Muslim physicians in early modern India is provided by another Persian manuscript held by the Wellcome Institute. The author of this *Handbook for Physicians* was the Persian physician and historian Muhammad Qasim Hindu Shah Astarabadi, called Firishtah (d. after 1033/1623). He compiled it in the late sixteenth or early seventeenth centuries (Keshavarz 1986, 109–110). The *Handbook* is not merely of interest because it contains the traditional topics of simple and compound medicines, but because it discusses tastes and smells, which Castro celebrates in Costa's book as Orta's innovative writing (Keshavarz 1986, 110; Costa 2015, 67–88). Born in Astarabad at the Caspian Sea, Firishtah grew up at the Nizam Shahi court of Ahmadnagar and is famous for his history of India, which also includes long passages on the Nizam Shahis, including Burhan al-Din. Thus, his father was in all likelihood another of the courtiers in Ahmadnagar whom Orta will have met during his visits there.

The Methodological Impact of the Language of the Inquisition on Modern Representations of Orta

The continued usage of the language of the Inquisition and of the institution's documents without clarifying which position the modern academic takes in this regard is misguided and misleading. Orta was not a "New Christian" or a "Marrano," let alone a Jew as the Goan Inquisition claimed in 1580. He was born into a "converso" family and baptized as a newborn baby. This makes him a Christian. Having been born in Portugal, this ritual in all likelihood made him a member of the Catholic Church. In his book, Orta repeatedly emphasizes this membership as his religious identity. His contacts with Jews are legitimized as components of his scholarly identity, as well as the outcome of his connection with his patron Martim Afonso de Sousa. Insisting on a Jewish identity for Orta on the basis of Inquisition documents with information based on mental and physical torture of relatives produced immediately or many years after his death is methodologically questionable. It means on the one hand to accept the Inquisitorial verdicts as "truth" and to insist on the other hand on a shared single Jewish identity among Jews, "conversos" and other people accused by the Inquisition of "Judaizing" as motivating and explaining Orta's book in general and in some of its individual elements. One of the many problematic sentences of this kind in publications about Orta, which illuminates the deep-seated prejudices against baptized children born to "converso"-parents and their descendants, is found in a paper about food and smells in Orta's book: "Although Orta never expresses his beliefs, particularly in a medical treatise, a New Christian would find it difficult to ignore the precepts of Judaism" (Costa 2015, 79).

The indiscriminate use of the language of the Inquisition by historians and other academic writers transcends the boundaries of history of science.⁵ It is present even in the most recent works of highly praised writers on the Inquisition. Against this custom, I agree with Saraiva, who is dismissed by certain early modernists as a pariah of Inquisition studies, against using this language, a point also discussed clearly from a different perspective by García-Arenal.⁶ Numer-

⁵Saraiva's insistence to abstain from using the language of the Inquisition remains also valid, when in some cases the persecution was indeed caused by religious fervor. Given the very hostile reaction of the Portuguese reviewer towards my support for Saraiva's position in respect to the widespread use of the inquisitorial terminology by current authors, I wish to underline that I do not mean here to revive the discussion between Saraiva and Révah nor do I share the belief that a political conviction of an author, in this case Saraiva, necessarily invalidates any of his historiographical claims, Saraiva (2001, 235–341).

⁶García-Arenal (2013). Bethencourt, for instance, claims that Saraiva's main thesis (which is of no direct relevance to my paper) of the invention of the crime of "Judaizing" as a means to fight the emerging mercantile middle class was merely an assumption and a false one, Bethencourt (2009, 25). But all Bethencourt offers as a justification for his rejection of this thesis is that he cannot see a conflict

ous examples in Bethencourt's highly praised book on the Inquisition prove the only point I wish to repeat here in the interest of my arguments in this paper: the continued usage of the language of the Inquisition has a distorting impact on the academic evaluation of its activities, goals, moral and sources. One of the clearest expressions of this impact is Bethencourt's claim in his conclusions that "(i)n Portugal, Judaism almost monopolized inquisitorial activity" (Bethencourt 2009, 442). What he meant is that the tribunals persecuted men, women and children almost exclusively by accusing them of "Judaizing." The same kind of denigrating language can be found in Black's book on the Italian Inquisition (Black 2009).

The continued usage of the language of the Inquisition is entangled with two other historiographical and methodological issues. One issue concerns the interpretation of the purposes and goals of the different types of Inquisition. Historians of science and medicine writing about Orta often ignore the acknowledgment in other historical circles that the early modern Inquisitions were not only and often not even primarily directed towards establishing or maintaining the supposed purity of Catholic doctrines and behavioral standards, but served political, economic and social goals such as control, empire-building, destruction of alternative ways of living or exclusion of real, perceived and invented enemies.⁷ The second methodological problem concerns the documents produced by the Inquisition. It is of relevance to those who wish to maintain that the statements in the testimony of Orta's sister Catarina produced during her trial in Goa under torture deliver correct and reliable data about herself as well as her immediate and her larger family, including the beliefs and customs of her brother Garcia. It is equally of relevance for historians of Jewish history in Europe, North Africa, the Ottoman Empire and India and those of the so-called "conversos."

Costa and her colleagues do not problematize this issue, but accept such documents as reliable sources for evaluating religious, dietary, political, commercial, sexual and other activities of the persecuted women and men and the (real or invented) people whom they spoke about (Costa 2015, 46, 11–31). It is, regrettably, only in his final remarks that Arrizabalaga points to several important issues that are in need of a more serious reflection than the overwhelmingly simplifying identification of Orta and other victims of the Inquisition according to the language of this institution (Costa 2015, 32). The essentialist identification of Jews and Christians in those discussions is one of them (Costa 2015, 32). A position of high relevance to my own view as an outsider on the ways how Orta's life and book has been treated by historians of science and medicine, as well as representatives of other academic fields is that of Gutwirth who already in 1981 expressed

of interest between the Portuguese aristocracy and this mercantile class, Bethencourt (2009, 25). He simply silences other studies supporting and modifying Saraiva's thesis (2001, XIII–XIV).

⁷Benassar (1981); Dedieu (1989); Cunha (1995); Saraiva (2001); Delgado (2011).

what I thought after reading the papers published before Costa's book. Gutwirth namely came to the conclusion "that historians had in fact been reproducing the categories used in their sources, following in the footsteps of the Inquisitors themselves in the way they accepted the definition of groups, the priorities among their activities and the very formulation of questions."⁸

Against the contributors to Costa's book, I do not believe that Catarina's testimonies produced under torture illuminate in any reliable sense the beliefs held by herself or her brother, nor can they be accepted as trustworthy with regard to the dietary and other customs of their larger family's daily life or the identities of the people named by Catarina. I am also astonished that in the literature only the second tribunal record against Catarina from Goa is used for arguing for or against her "Jewish identity" and that of her brother, while the first from Lisbon produced between May and October 1547 is—as far as I have seen—never discussed.⁹ In general, the study of non-printed primary sources is not often made visible in the articles I have read for this paper, including Costa's book.

Otherwise there are many different and dissonant voices with regard to the interpretation of the documents produced by the Portuguese and other Inquisitions.¹⁰ They are for the arguments of my paper of relevance only insofar as they show how important a new reflection on the Inquisition records on Catarina is.

The Fundamental Shortcoming of Previous and Current Research on Orta's Book

Keshavarz's information about Persian physicians at the Nizam Shahi court and their works supports my basic critique of previous studies on Orta and of several of the papers in Costa's book: Orta's book cannot be appropriately analyzed and evaluated by Europeanists alone. It has to be studied through teamwork. New methodological reflections are needed for identifying and interpreting the manifold layers that characterize it. For Europeanists and students of the Portuguese colonial empire, this applies in particular to the testimonies produced in Inquisition trials, to travel accounts and to surveys on "Asia" by early modern Portuguese, Spanish and Italian writers, to complaints by clerics and anonymous writers about the local conditions in Portuguese "India" and the behavior of the various groups of people living in the colonial enclaves; and finally, to letters of various kind by the colonial administration, the Portuguese crown and Catholic

⁸Quoted according to García-Arenal (2013, 12); García-Arenal makes the same point in a different context slightly earlier in her paper (2013, 7)

⁹See <http://digitarq.arquivos.pt/details?id=2304298:PT/TT/TSO-IL/028/04317>.

¹⁰Rivkin (1957); Saraiva (2001); Del Col (2006); Black (2009); García-Arenal (2013) and the literature listed there.

orders. In all these kinds of sources, multiple processes of intentional or sub-conscious mis- and re-interpretation are at work, which have to be excavated and contextualized.

In order to recognize them it is necessary to compare Orta's text on the one hand with earlier works on drugs, history or travels by Portuguese or Italian authors such as Tomé Pires, Duarte Barbosa or Ludovico Varthema and on the other with medical and historical texts by Muslim and Hindu scholars in Persian, Sanskrit, possibly other Indian languages, and Latin translations of those Arabic works, which Orta refers to time and again. In her contribution to Costa's book, Županov makes several interesting and at the same time surprising claims about Orta's medico-botanical knowledge (Costa 2015, 53). Against the majority of earlier voices, her own earlier papers included, she is now convinced that this medico-botanical knowledge is neither new nor exceptional, but was "common knowledge in Goa among the *casados* and the Portuguese officials, apothecaries, physicians and merchants" (Costa 2015, 53, 55–6). She downplays the "inductive methods" still praised by other contributors to the book claiming that it meant nothing but "that he was dependant (sic) on myriads of accounts brought to him by a variety of historical actors, his contemporaries in India" (Costa 2015, 56). She informs her readers that "(i)t has been established by historians, more recently by Teresa Nobre de Carvalho, that Orta had at hand a wide variety of accounts by Portuguese officials and Italian travellers ..." (Costa 2015, 56). Unfortunately, she does not name the earlier historians nor does she provide any reference to a paper or book in which Orta's use of such a wide variety of Portuguese and Italian texts with information about plants and drugs has indeed been established. She merely points in her footnote to this passage to Orta's well-known reference to Ludovico Varthema and to his mistaken claims about the difference between black and white pepper against an unnamed Portuguese apothecary in Goa, a passage which she herself analyzed in an earlier paper (Costa 2015, 56, fn 26; Županov 2009).

Carvalho indeed writes in an English summary of her doctoral research that Tome Pires's (ca. 1465–ca. 1540) and Duarte Barbosa's (ca. 1480–1521) "information collected by these royal officials was included in Garcia de Orta's work" after having been "confirmed and validated by Orta's inquires (sic), observations and medical experience" (T. Carvalho 2013, 15). Unfortunately, in her thesis she does not prove that Orta truly had known the texts of both writers and confirmed or even validated their information. The brief summaries of the works of these two as well as other Portuguese and Italian travelers in her thesis do not discuss their impact on Orta's book nor does she prove in her chapter on the latter's library and his use of Pliny's, Dioscurides's and Ibn Sina's texts that he had read or reflected on the Portuguese or Italian works (T. Carvalho 2012, 189–272).

Hence, a reliable comparative analysis of these sixteenth-century writings about Asian drugs, plants and histories remains an important desideratum. The lists of plants, fruits and spices given by Duarte and Pires overlap undoubtedly with much of what Orta writes about (T. Carvalho 2013, 14–5). But this alone does not prove that Orta has had access to their texts. This knowledge was common knowledge on the markets in India and other parts of Asia, as Orta more or less clearly writes himself. It also was commonly known among Muslim and in all likelihood Hindu physicians and druggists as the Persian texts on fevers, drugs, plants, foodstuff and sex listed in Keshavarz’s catalogue of the library of the Wellcome Institute (as well as in other catalogues of Persian and Arabic medical manuscripts all over the world) show.

A systematic study of this commonly known knowledge and its written codification at the time of Orta’s presence in India is a second desideratum. It is of even greater importance for a less magnifying, nationalistic and simplifying evaluation of Orta’s work than the comparative study of Portuguese and Italian texts, because they too depended on this common local knowledge available orally or in written form in different sectors of the various societies in South and Southeast Asia, Portuguese India included. Further texts that need to be read in conjunction with Orta’s book are the Latin translations of medical and pharmaceutical texts in Arabic, which Orta studied in some form at the universities of Salamanca and Alcalá de Henares and pharmaceutical texts that practicing physicians used on the Iberian Peninsula. Both types of texts contain information about Asian drugs and plants from a variety of sources. The pharmaceutical glossaries of practitioners on the Iberian Peninsula list since about the eleventh century Arabic, Hebrew, sometimes also Greek, Syriac and Latin, and over the centuries in increasing numbers vernacular names of plants and drugs (Bos and Mensching 2005; Bos and Mensching 2015).

General Historiographical Problems with Regard to Scholarship About Orta’s *Colóquios* Before 2015

Three themes rank highest among the various approaches to the study of Orta’s book: (1) his role as a scientific hero; (2) his role as a transmitter of knowledge and culture between “East and West” or between “civilizations”; (3) the purposes of his book. The first two themes and their representation cut through all types of methodological stances. Historians express their shared conviction that Orta was an experimental scholar of a new kind, a person who clearly broke with the ancient and medieval authorities in Greek and Arabic in their Latin translations, the very first and systematic author of a book on Asian *materia medica*, the first re-

porter of the clinical properties of (epidemic) cholera in precise and recognizable symptoms, and a man curious to know languages, nature and people.¹¹

The problem with practically all those claims is that they are often substantially and sometimes partially in conflict with the explicitly formulated content of Orta's book. Orta certainly wrote more than once about experience and truth, naked truth even, as a few recent historians found worthy to celebrate (Županov 2009, 21; 2010, 41; Pimentel and Soler 2014, 118). But we should ask in which sense these references to experience or experiment differed from these very same terms in medieval medical or philosophical texts. Instead of celebrating such terms for their apparent novelty, we should check the quantitative frequency of their usage and of the groups of words related to them. The application of current technical tools for such purposes is able to provide other information than a manual survey can deliver. A preliminary frequency check of the text found in Count de Ficalho's Portuguese edition posits many difficulties for a convincing interpretation, because the notes cannot be separated from the main text.¹²

A search of the 500 most used words in in this edition shows no occurrence for *experience* or *experiment* and only 111 occurrences or 0.08% for *verdade* together with 39 occurrences (0.03%) of *verdadeiro*. In the semantic analysis these two groups are more closely related to traditional forms of knowledge production like writing, author, writer or book than to terms that point in the direction of particularities, tests, trials, experience or experiment. I do not wish to suggest with this quick excursion into the possibilities of a quantitative, software-supported analysis of word frequencies that these numbers necessarily contradict the results of the qualitative analysis, that is, the isolation of specific formulations about truth and experience and their interpretation. I nonetheless think that a fair and solidly grounded analysis of Orta's text needs to pay attention to such textual features.¹³

Orta rejects time and again ancient medical authors for their insufficient knowledge of the plants he writes about. But he does the same and in sharper tone with his contemporaries. His attitude towards medieval Muslim authors, in contrast, differs recognizably from these two other groups of writers. It is true that he repeatedly criticizes Ibn Sina, Ibn Rushd, Ibn Sarabiyun and Ibn Masawayh, but he also shows his clear appreciation for their texts, opinions, and even their mistakes. He defends them against what he considered the unreasonable attacks of the Humanists, his contemporaries, whose bad moods towards "the Arabs" or

¹¹Boxer (1963); Fischel (1974); Barreto (1985); Grove (1995); Mathew (1997); Cook (2007); Walker (2009); Županov (2002, 2009, 2010); Costa and T. Carvalho (2013); Pimentel and Soler (2014). Grove's *Green Imperialism* (1995) copies almost verbatim his article of 1991. Hence, I will only refer to the former if its slight modifications are relevant to my argument.

¹²Count of Ficalho's name is Melo Breyner. I will use its second part according to Portuguese custom in the rest of my paper instead of the title given in the edition.

¹³I thank my daughter Rana for her support with this quantitative study.

“the Moors” he denounces as self-serving and false: “You seem to be very much attached to these modern authors who, in order to praise the Greeks, speak evil of Arabs and of some Moors born in Spain, and others in Persia, calling them ‘Maumetistas’ and barbarians (which they hold to be the worst epithet there is in the world), especially the Italians [...]” (Orta 1891, 31; 1913, 13).

The quantitative analysis moreover shows that after Orta and Ruano, the two interlocutors of the dialogues, the scholar most often referred to is Avicenna, that is, Ibn Sina (d. 1037). Ibn Sina’s name occurs 126 times (0.09%).¹⁴ Dioscurides’s name appears 87 times (0.06%). Galen is ranked third with a drop by 50% (45 occurrences). Despite the preliminary character of my analysis and the problems it poses, the quantitative distribution of these three as well as the few subsequent names that fall into the group of the 500 most frequent words, highlights the overwhelming attention that Orta paid to Ibn Sina and his medical canon *al-Qanun fi l-tibb*.

Orta names medical applications of the plants he describes and occasionally also depicts symptoms of diseases in less than a third of his chapters. Moreover, in most of those cases he merely states that a given plant can be used as a purgative, as relief for fever or as food. In contrast, Orta presents a significantly smaller number of elaborate, detailed explanations, whether they concern remedies or diseases. In the case of plants, the situation is different. Here, Orta indeed provides more regularly a larger range of data about the type of the plant (tree, shrub, flower), its leaves, blossoms, fruits, size, bark and other features. But even in this case, he does not proceed in a continuous and systematic manner. The information about plants is not exclusively of a medical, that is, scientific, orientation. Orta speaks of the commercial use of plants and stones at least as often, if not more, as of their medical usage. Several times, he also elaborates the culinary value and use of a plant. Orta’s interest in the objects he enumerates clearly is not the straightforward medical progress or the sharing of Eastern knowledge with Western readers claimed by twentieth and twenty-first-century historians.

Evaluations of Orta’s Knowledge of Languages

Opinions about Orta’s knowledge of Asian languages vary widely, as do the perspectives from which this knowledge is evaluated. Cook, Costa and Carvalho believe that Orta learned some Arabic in India or cooperated with locals who knew the language (Cook 2007, 98; Costa and T. Carvalho 2013, 5). Orta admittedly creates an illusion of knowing the language by claiming that he owned an Arabic

¹⁴This figure includes the footnotes. Since the text spells, in contrast to the footnotes, the name of the Muslim scholar with one n only (Avicena), I can easily provide the number of its occurrences for the text without footnotes, something that cannot be done for other terms: 92 times (0.07%).

text of Ibn Sina's medical summa *al-Qanun fi l-tibb*, which he had used to control the veracity of Andrea Alpago's new Latin translation. But his nonsensical beliefs that *al* is the genitive of the article and that *ma* in the word *magharabi*, which is a broken plural of the singular *maghrabi*, signifies *of* and thus can be separated from the plural form, leave no doubt as to the wildly exaggerated character of the claim (Orta 1891, 36; 1913, 18).

Grove believes that Orta had very little knowledge gained from his contacts with Hindu doctors (Grove 1991, 166–167). Pimentel and Soler expected that Orta had to be able to read Sanskrit texts in order to become a successful “cultural broker.” They scold him in general for his insufficient philological knowledge, choosing Joseph Justus Scaliger (1540–1609) as their expert to rely on (Pimentel and Soler 2014, 116 and fn. 47). They overlooked, however, that Scaliger knew only Arabic and thus was no competent judge of Orta's terminology in the remaining ten languages.

One of the problems with those philological evaluations is the lack of specific expertise among most of the evaluators. Another problem is the choice of sources on whom to rely for the evaluation. A third problem is the result of the expectations about what Orta should have been capable of in order to be a successful “broker between cultures.” A fourth problem relates to the usage that Orta's foreign words and expressions are put to. As a result of these four difficulties that the analyzed authors tackled, but did not overcome, no systematic and careful study of these names and expressions is yet available in addition to the laudable efforts undertaken by Breyner in his notes to the 1891/1895-edition of Orta's text.

Breyner's goal was to situate Orta's terminology within the medical, botanical and commercial terminologies of his time. In this respect, he provided a good basis for further studies. He rightly concluded that Orta's Arabic vocabulary was taken from the Latin translations of those Arabic texts that he had studied at the universities of Salamanca and Alcalá de Henares (Orta 1891, 42). As for the terminology ascribed to five Indian languages (Gujarati, Bengali, Deccani, Canarin and Malabar, that is, Gujarati, Bangla, Dakkhani, Konkani (?) and Malayalam) in addition to Arabic, Persian, Malay and Singhalese, Breyner provided Sanskrit, Arabic, Bengali, Hindi, Malayalam, Tamil, Malay and Singhalese words suggesting therewith interpretations or corrections of misunderstood, corrupted or creolized words. A few examples are the Sanskrit expressions *ghrita kumari*, *parajatak* or *parijatak*, *hing*, *vadari* and *vacha* for Orta's *catecomer*, *parizat-aco*, *imgu/imgara*, *vidara*, *batche*; the Tamil terms *konnekai* or *konraik-kai*, *kárruwá*, *manjal* and *shema kalengu* or *shema kilangu* for Orta's Malayalam words *condaca*, *cameá*, *manjale* and *chiviquilengas*; the Arabic term *salikha* for Orta's *salihacha*; the Malay variants *kamañan*, *kamiñan* and *kamayan* for Orta's *cominhan*, the Singhalese *coronde*, *kurunda* or *kurundú* and *puwak* for Orta's *cuurdo*

and *poaz* (Orta 1891, 37, 72, 90, 115, 126, 147, 198, 224–225, 282, 285, 335). Two of Orta's names (*parizataco* and *imgu*) are very close to the Sanskrit terms, and two others (*vadari* and *bache*) are not very far away from their correspondents. Given that Orta's words do not represent a spoken Sanskrit, but a dialect derived some centuries before from the literary language normatively spoken only by male Brahmins, these four words are fine specimens of local terminology. The Tamil background of Orta's supposedly Malayalam words comes as no surprise, since both languages are closely related and Tamil was more widely spread towards the west in the early modern period than is the case today. Nonetheless, this phenomenon emphasizes the need for a more systematic study of historical linguistic in western and southwestern India, if one wishes to appropriately understand Orta's knowledge.

Breyner was not an expert of the Indian languages referred to by Orta. He worked mostly with botanical dictionaries of the nineteenth century, produced in the British Raj. He was not and could not have been aware that some of the languages were still in a process of identification or separation, while others were neither purely Indo-European nor purely Dravidian, but mixed languages. Neither could he have been aware of our lack of knowledge of how languages were used in sixteenth-century India for claiming status and identities. The use of languages for sociocultural identity "policies" began only under the Raj (Mitchell 2005). Languages, states and identities continued to be reshaped throughout the twentieth century by the colonial administration and the subsequent new Republic of India (Mitchell 2009).

Hence, it is not easy, for Orta's period, to identify items as mistakes that from today's perspective can be clearly sorted and allocated. With more than 1,000 languages spoken across South Asia, local inhabitants everywhere were multi-lingual. They would have had their own ideas about the languages they spoke. Orta's "mistakes" might reflect those oral idiosyncrasies or multiplicities and thus may not have been mistakes at all. Working with today's dictionaries of the Indian languages mentioned by Orta may generate mistakes, rather than detect them due to ordinary changes in language content, meaning and usage, but above all, due to the complex and at times controversial language policies of identity in India's modern history. Thus, a fair and solid evaluation of Orta's botanical, medical and culinary terminology in Gujarati, Bangla, Dakkhani, Konkani (?), Malayalam and Singhalese will only be achieved with the help of experts in historical linguistics and the sociocultural contexts of those languages. As for Malay, Orta learned his few specialized terms in all likelihood from Portuguese merchants who traded east and southeast of India, because they seem to be similar to the terminology that Mahdi lists as Portuguese Creole (Mahdi 2007). Hence, a history of Por-

tuguese Creole botanical and pharmaceutical terms is needed for evaluating this element of Orta's vocabulary.

The Oral Character of Orta's Language Specimens

Orta's alleged Malayalam and his Malay and Singhalese specimens are particular examples of my overall observation that his terminology of South and Southeast Asian origin has a dominantly oral character and does not reflect any familiarity with written medical or pharmaceutical texts. This oral character of Orta's local knowledge is made visible not merely by problems of transliteration, spelling and misinterpretation of sounds. It becomes strongly visible in the language Orta used when talking about it. He asked local doctors, he conversed with them, and he had discussions with physicians and merchants (Orta 1891, 180–181; 1895, 289, 291). One explicit description of how Orta learned local names, properties and the medicinal usage of plants is found in one of the last chapters (ch. 54), where he talks of a visit to Diu in about 1535:

One day being in the Bazaar (as we call the market or fair) in the afternoon, sitting at the door of one of the merchants they call Banians, a woman came past with a sack of dried TURBIT for sale. As I was an expert in medicines, and had heard that they were brought there for our ships, I asked the Banián what it was. He replied that it was TERUMBU, and that we and the Moors gave it that name, but that the Maratas (who are Gentios) call it BARCAMAN. I then asked for what it was bought and its use. He said it was of use to purge the stomach, and he showed me its gummosity and whiteness. (Orta 1895, 329–330; 1913, 433)

The declaration at the beginning of this chapter highlights another reason for some of Orta's confusions in regards to Indian plant names. While in this little story just quoted he says clearly that the Gujarati merchant said that the name *barcaman* was Marathi, when Orta lists names of the plant he writes that *barcaman* was Gujarati (Orta 1895, 328; 1913, 431). The modern Gujarati name of *Ipomoea Turpethum* is *nasottar*. But the Gujarati merchant also erred, since the three modern Marathi names for the plant are *shetvad*, *nishotar* and *tend*. None of the Indian lists of local names for this plant that I found provides anything close to *barcaman*. Orta's name of the plant as used in Goa is *tiguar*, which seems to be of Dravida origin, as the modern Kannada name is *vili* (or *bili*) *tigade* and the Malayalam names also include *tigade*.¹⁵

¹⁵<http://medplants.blogspot.de/2012/11/operculina-turpethum-indian-jalap.html>.

Orta's Narrative Strategies and Their Functions

Orta composed his work as a dialogue in fifty-eight chapters and one addition between two fictitious characters, Orta and Ruano. Both represent himself, different positions in medical teaching and writing, as well as different ideas about how to identify plants and remedies. Ruano is introduced in the first chapter as having arrived at Goa with his brother, who was an agent of the Portuguese Crown, that is, a royal mercantile servant (Orta 1891, 19). This is another mirroring of Orta's own practices as a merchant and physician. These practices are reflected in the further major talking points of the book: commerce, healing and books.

The books, Orta discusses, belong to three major periods: ancient Greek authors; medieval authors from Islamic societies; early modern Humanists. The members of these three oppositional groups are not on equal footing. It is here where my views deviate from numerous current writers about Orta's book. Grove, for instance, believes that Orta's text was "hostile to European and Arabic knowledge" (Grove 1991, 164).

It has been rightly acknowledged that this rhetorical setup of the text, while not at all rare in the period, provided Orta with a substantial liberty to present in a clear and poignant manner questions, doubts, beliefs, affirmations and rejections (Županov 2010, 41; 2015; Gutwirth 2010). This clarifies that Orta did not merely mean to "transmit Eastern medical and botanical knowledge to the West" as Costa, Carvalho and other modern writers believe (Barreto 1985; Costa and T. Carvalho 2013). He had programmatic goals that included first challenging recent developments in medical and pharmaceutical literature and legitimizing propaganda among Humanist writers in Italy, France, Spain, Portugal and German lands.

A second programmatic goal undoubtedly includes reflecting on what we call today "best practice." This "best practice" included a substantive and broadly construed critical and comparative discussion of literature as taught at universities in western and southern Europe. It also includes comparing this literature with products of nature and experiences of healing practices in India, which have to be described, tasted and occasionally tested. While this has been lauded in the general sense of "progress," things are not that easy and straightforward. Sometimes Orta presents his search for "truth" as a literary, intellectual endeavor. Sometimes it is gruesome reality that imposes on him and his young colleague, Dimas Bosque, the need to turn to local experience, practice and objects. In cases of conflicting approaches and beliefs, however, it is always the character Orta who describes himself as the polite, but clearly superior knower and practitioner. He is described as someone who is not merely successful when locals apply "theoretically weakly grounded" experiential cures, which sometimes work and sometimes don't, but who knows before the contest that his methods of curing are superior

and will be recognized by foreign rulers in India outside the borders of Goa (Orta 1895, 140–142).

Hence, Orta presents himself as a coveted subject who receives extraordinary offers of payment and positions, which he partly rejects since he is “a good Portuguese.” He also describes himself as an envied competitor against whom various intrigues are spun, but never succeed. Orta’s “experiential search for truth” is thus not alone an issue of epistemology, but as much or even more so an issue of social competition. Thus, the creation of Orta as the successful navigator in strange social, cultural and professional waters is a third programmatic goal of Orta’s text. This part includes also Orta’s description of his commercial success, after having arrived with what he downplays as “little property” (Orta 1895, 260; 1913, 379). When Orta writes his book he is the proud and very wealthy owner of at least two merchant ships and an extensive network of commercial partners. This is no surprise, since the allegedly little property contained five quintal, that is, about 500 kg, of guaiacum, which despite the losses at sea Orta still could sell in Goa for 1,000 cruzados (according to Cook about 800,000 \$) (Costa 2015, 132). The importance of Orta’s persona as a successful merchant has been acknowledged in modern research literature, but is often put below and behind his rôles as an author, reader and doctor.

The rhetorical and programmatic flexibility of Orta’s text suggests accepting that other, rarely, or not at all discussed features also reflect intentional decisions made by him. Such elements of Orta’s programmatic decisions with regard to what to write about and how to do it include: his various silences and emphases, the prevalently irenic atmosphere of his depictions of his household, the city of Goa and any of the Muslim states around it, the inclusion of “political” digressions about the five Deccani sultanates and his references to his participation in campaigns against Muslim and Hindu rulers without ever talking about their bloody, violent nature, as well as the complete absence of his family.

Orta’s Representation of His Knowledge as a Dictionary

Orta’s multilingual botanical, medical and zoological terminology is closely connected to this preference for Arabic words and authors. Assuring Ruano of his qualification for evaluating the Humanists’s works and for comparing Latin translations of Arabic texts with their original in order to judge the translation’s reliability endows his refutation of Humanist reductionist practices with substance. Directing Ruano’s attention to the fact that this body of medieval Arabic knowledge taught on the Peninsula relates to the practices of local Muslim physicians and that it provides access to new knowledge and cures for healing through describing and naming plants and remedies unknown to his teachers and colleagues

in Europe enlarges his own reputation and status. It also confirms his teacher's belief that knowing Arabic words was necessary for the successful doctor and for good practice.

The linguistic nature of Orta's book, which is set up as the main explicit framework for narrating and evaluating old and new knowledge at the very beginning of his text into which everything else needs to be integrated, is thus Orta's basic and most easily visible principle of order. Epistemology and ontology, that is, truth, experience, appearance and configuration, only occupy subordinate levels of organization. They deliver keywords and catch phrases, but do not order things or narration. They solidly serve the construction of Orta's persona as an erudite in every-day life outside of study. But contrary to the dominant interpretation they do not guarantee the veracity of Orta's statements, neither with regard to plants and diseases and their identities nor with regard to the authors Orta praises or criticizes. Time and again Orta's statements do not agree with ancient or medieval texts, symptoms of diseases or properties of or relations between plants. Epistemology and ontology were certainly important resources for Orta's argumentation for or against authors, healing practices or objects of nature. They served to challenge established literary knowledge. In a few cases, Orta also presents them as a tool for producing new knowledge. But he did not build his classification and evaluation of things on their basis. Naming plants and remedies was of course at Orta's time a centuries-old principle of organizing knowledge. Orta was not setting his foot on unploughed soil with his decision to use them as a tool for structuring the string of his chapters according to the Portuguese alphabet. Although Orta criticizes Ruano's proposal to choose the alphabet as the structural principle of order, Orta nonetheless follows it with very little deviation. His text indeed resembles a dictionary. In choosing this format, Orta may have bowed to António de Nebrija, one of his best appreciated teachers.

It is, however, not a simple dictionary of corresponding words. This is not only so, because he wished to talk about much more than names. Going through the titles of his chapters, it quickly becomes clear that the alphabetic structure is neither simple, that is, consisting of one name only, nor completely regular. More than one chapter title contains more than one name of a plant, drug or disease or mixes two or three of these different items. In a few cases Orta comments on the following content of the chapter to forewarn the reader that it will not be about medicine or is meant to be a digression. Orta's structure of order is thus openly disorderly. This renouncement of strict order shows in a further property of the chapter titles. The names offered there to the reader combine, as far as I can tell without substantial study, three different linguistic layers: names of the traditional Greco-Arabic-Latin *materia medica* in vernacular or Latinized form, names from vernacular Indian languages and Portuguese Creole names, that is,

names of plants and drugs known among the Portuguese in Asia before Orta's arrival and noted in chronicles, travel accounts or letters (Orta 1891, 23, 45, 74, 95, 103, 117).

An early example of this mixing is the title of the seventh chapter: "Coloquio setimo do Altiht, Anjuden, Assa Fetida, e Doce, e Odorata, Anil" (Orta 1891, 75). The languages combined here are (a corrupt) Arabic, Persian and Portuguese Creole on the basis of the Arabic form *al-nila* of the Sanskrit term *nila*. Duarte Barbosa, who was the scribe of the Portuguese factory in Kannur (Cannanore) at the Malabar Coast between 1500 and 1516/17 and who wrote—according to Giovanni Batista Ramusio (1485–1557)—his first book about his experiences in 1516, calls *indigo anil* (Orta 1891, 93, note 7). Although Barbosa's manuscript was not published before the nineteenth century, his knowledge may have circulated orally or in form of lists among Portuguese administrators, merchants, physicians and druggists in India. At the very least, his text confirms that the form *anil* was used by scribes in the Portuguese commercial system before Orta wrote his book.

Further Structural Elements in Orta's Narration

Looking for the execution of structural principles and the presentation of the promised knowledge it is easy to discover another important feature of Orta's text that speaks against the simple stories of epistemological progress and cross-cultural accumulation of knowledge. Below the level of the alphabetical as the main principle of order, a systematic, regular execution of declared intentions and goals does not take place. Names in all the languages that Orta uses are only irregularly provided. Medical or pharmaceutical instructions allowing the new knowledge to be learned, copied and imitated are more often either lacking or overly brief and general. It is at best the initiated that can make use of them. Orta's text is thus neither a handbook for the practitioner nor a textbook for the student.

Orta's ambivalence is also to be seen in his classification, which was not local as Grove claims, but mixed (Grove 1991, 166). In order to make local plants and remedies useful in Orta's intellectual world of healing, they had to be integrated into the knowledge he had acquired in Spain. This is the main function of his alphabetical approach and the second function of his extensive debate with ancient, medieval and early modern authors, in addition and beyond his decision to set them up for critique and appraisal.

However, if the only alphabet that Orta could read was the Latin one, no other alphabetical options were available to him. His text at the very least does not show any trace of such knowledge. Another issue that limits the hold of the

Portuguese alphabet over local names and their objects is the rôle and visibility of writing in Goan public life in the first half of the sixteenth century. If Orta had no incentive to learn reading Devanagari, Arabic, Vattellutu (for writing Malayalam until the seventeenth or eighteenth century), Kannada or Bengali scripts, even on a limited level, his decision for an alphabetical arrangement of the plants and drugs he wanted to discuss meant necessarily a decision for the Portuguese alphabet.¹⁶ If, however, he could read another alphabet, other options were open to him for alphabetically organizing his narrative. Not choosing them would then have meaning. Hence, for fairly evaluating Orta's work and its multilingual features, a history of writing in Goa as well as familiarity with the general cultural environment during the first half of the sixteenth century is needed.

Another ambivalent relationship characterizes Orta's choice of the book's title and the book's content. The book's title combines traditional medical terms (simples, drugs) with a focus on a newly "re-opened" territory (India). The book's content goes much beyond these two points. Numerous matters belonging to other genres of knowledge and other kinds of narration also appear: a survey on the more recent history of the Deccani sultanates, most likely appropriated from other sources; comments on his "travels" in western India and along the coast to Sri Lanka; reminiscences on Muslim rulers and their courts; depictions of his close and friendly relationships to leading clerics of Goa and Kochi, governors or viceroys of Goa, the sultans of Gujarat and Ahmadnagar and his gardens in Mumbai and Goa; and a very few events in Goa, mostly relating to diseases. Although such topics, which are not directly related to simples and drugs, were not strictly absent from all previous texts on *materia medica*, neither was their inclusion standard fare. Carolus Clusius opted against a number of them, when he paraphrased Orta's book in Latin in 1567. He added other themes, for example geographical information appropriated from books. This indicates that he had a different idea about what constituted a pharmaceutical text, even if this text was on simples and drugs from India unknown to himself. Orta's choice of title and themes of discussion or questioning was thus part of his programmatic approach. The conservative title suggests a traditional kind of professional book extended to India. The choice of thematic digressions permits him to develop his autobiographical story and the manner in which he wants his readers to see and appreciate him.

¹⁶A script for Gujarati was only invented in 1592. Dakkhani was written either in Devanagari or in a slightly modified form of the Persian version of the Arabic alphabet. Konkani is found in three kinds of script before the introduction of the Latin alphabet for it: Devanagari, Kannada and Vattellutu.

Orta's Autobiography as a Second Textual Layer

The strong presence of instances related to his activities in India since his arrival in 1534 defines the autobiography as a second text within the alphabetical representation of simples and drugs. This autobiographical narrative possesses three outspoken features and one element of silence. The outspoken features concern his depiction of his professional status as a doctor, his success as a merchant and his excellent connections with the Goan secular and ecclesiastic elites, as well as with some of the main Muslim neighbors of Goa. The glaring element of silence in his autobiographical narrative is the absence of all members of his family (Županov 2010, 41). He also kept silent about all of his acquaintances among Goa's merchant community, including those with whom he carried out his own business ventures.

In his narrative, Orta constructs his status as a doctor through two kinds of reports: reports about encounters with Muslim and Hindu doctors, often outside of Goa, and calls to high-ranking patients. The first group of reports depicts him as the almost always superior physician who knew a broader range of texts and the better methods to healing. It is primarily his knowledge, his training and his experience that Indian diseases validate, because he repeatedly heals them better than all local doctors (Orta 1895, 137, 140–141; 1913, 306–307, 309–310).

Another form of the same message is the use of a Brahmin physician in Goa for confirming information that Orta gave to Ruano about local plants and for making him say: “Dr. Orta knows better than all of us, for we only know the Gentios, but he knows Christians, Moors and Gentios better than we all. I kiss the hand of your honour” (Orta 1895, 332; 1913, 436). The chosen language strengthens the effect of this passage. While the Brahmin expert, who is clearly identified as “o fisico,” addresses Orta as “doutor Orta” and “vossa merce,” whose hand he kisses, Orta simply calls the Brahmin by his given name: “Girl! call Malupa [...] Malupa! tell this gentleman, who is a doctor, [...]” (Orta 1895, 331–332; 1913, 435–436).

The second, smaller group of reports presents him as superior to local Hindu doctors and as familiar with the local interpretation of the diseases, since he possesses experience and theory, while they, he claims, are pure empiricists (Orta 1895, 137; 1913, 306). But even in this regard, they can fall short compared to Portuguese healing practices. In Orta's narrative, while knowing well, for instance, how to heal dysentery or how to diagnose with the pulse, the Hindu doctors did not know, prior to the arrival of the Portuguese, how to bleed or how to draw conclusions from the urine. When applying Portuguese methods, he assures Ruano, they make mistakes or imitate those methods like monkeys (Orta 1895, 137; 1913, 306). Orta, however, chose the word *bugio* for describing the behav-

ior of Hindu doctors, not *simio*, which represents monkeys and apes as an umbrella term. *Bugio* is much more specific. It signifies the howler monkey, which lives in South and Central America. It was considered the loudest of all animals. He could have known about this from his patron Sousa, who had been the first governor-general of Brazil. *Bugio* can also be used to signify the *macaque*, some species of which live along the western coast of India. Moreover, *bugio* also signifies *cinocéfalo*, the doghead, which today is an umbrella term for *macaques* and *baboons*. The doghead in Christian mythological cosmology is one of the less-than-human life forms that populate Asia and in some cases also Africa. Hence, Orta's designation of the Hindu doctors as *bugios* is a crude as well as subtle insult of multiple degrees.

Ayurvedic medicine is of course not a system of healing without doctrines. Orta's misrepresentation of the Brahmanic system may be the result of his ignorance of Sanskrit texts as Pimentel and Soler suggest (2014, 116). But Orta never even gives the tiniest hint of having been interested in these writings nor of ever having seen their manuscripts, which differ strongly in appearance from Latin, Arabic or Persian manuscripts. His emphasis on the empirical character of local Hindu healing practices may thus rather reflect a more broadly shared attitude among doctors from the Iberian Peninsula towards local remedies and cures. Orta presents them in two main functions: as helpful means for criticizing and correcting textual knowledge about the classical Graeco-Arabic-Latin *materia medica* and as proper means for combatting local diseases.

These two functions reflect the overlap between Indian *materia medica* and medical practices with the Greco-Arabic-Latin traditions as well as their differences. Indian plants, remedies and healing methods had been partially integrated in the Greco-Arabic-Latin traditions since antiquity. A more substantive assimilation took place beginning in the late eighth century, when Sanskrit texts on medicine were translated into Arabic in Baghdad. During the seven centuries before Orta's arrival in western India numerous further mergers between pharmaceutical knowledge available in Arabic and Persian and that available in Sanskrit took place in addition to the extensive overlap of plants and drugs caused by trade. However, the overlaps remained partial and were, most important for the discussion of Orta's textual practices, not present in the author's medical consciousness. It is thus not surprising when in Orta's narrative local remedies that were not part of the traditional Greco-Arabo-Latin *materia medica* had an ambivalent status as did healing methods. Although a number of them made it into the title of a chapter, reflecting thus an equal status with an older, well-known plant or drug, Orta did not arrange his text in a manner that gave the new, local objects clear precedence. Dimas Bosque's praise for a South Indian plant used by the locals against dysentery shows that he only turned to it when the standard collection of

drugs and tools transported on ship from Portugal to Portuguese India had been depleted.¹⁷

Orta's comments on Muslim physicians mix appreciation with condescension. When Sousa fell ill with fever in his military campaign undertaken together with Bahadur Shah from Gujarat against the Mughal army of Humayun (r. 1531–1540, 1555–1556), the Gujarati Sultan and Orta had a little dispute over who could better heal such a kind of sickness. The Sultan was convinced that Portuguese doctors fell short in this point, while Orta believed the same for the local doctors. Turning to Ruano after telling the little story, Orta comments: "Further, as their physicians are not learned, there are none that cure to our rules" (Orta 1891, 140; 1913, 310). Such a comment on the physicians in Bahadur Shah's environment is certainly inappropriate, whether Orta aims here at Muslim or Hindu doctors, since the Sultan's court was a highly literate, cultured place and most physicians will have acquired their knowledge through reading the classics of either school and receiving practical training with their relatives, another teacher or maybe in a hospital. The understanding of learned as signifying to follow the rules that Orta had learned at home describes his views on things a short time after his arrival in Goa. Although his appreciation for all groups of local doctors rose over time in regards to formal learning, he remains closely connected to the doctrines of Humoral medicine, and mostly emphasizes the respective education of Muslim doctors. Hence, not only is it inappropriate to characterize Orta's positions by today's values and terms; using concepts such as "multiculturalism" or "exchange between East and West" denies the obvious disequilibrium in Orta's narrative between the different medical systems and their practitioners.

One way to elucidate possible undercurrents below such explicit depreciation of the practitioners and their education consists in clarifying in a more systematic manner than done so far, the relationship between the different kinds of plants and remedies. Calling his text an eclectic mix of "Western, Arabic and indigenous" *materia medica* and healing methods, as Costa and Carvalho do, is certainly closer to Orta's text than the dichotomies created by Grove, Cook, Županov or Pimentel and Soler.¹⁸ But this does not suffice for capturing the connections between the different *materia medica*. A more precise determination of the usage of the various plants and drugs in the various healing systems in western India is necessary, because all of these systems often overlapped one another. They were also not static, unique and unified collections of things, but generally in flux and regionally different. For Orta, "indigenous" clearly meant at the very least two, if not more medical practices: that of Muslim physicians and that of Hindu doctors.

¹⁷Costa and T. Carvalho (2013, 5, 9) propose a similar view, following S. D'Cruz.

¹⁸Costa and T. Carvalho (2013, 6, 9); Grove (1991); Cook (2007); Županov (2009, 2010); Pimentel and Soler (2014).

Although it is not clear to me whether he further differentiated between the Hindu doctors, he clearly did so with regard to Muslim physicians, whom he names according to their geographical origins, mostly outside of India, according to his limited knowledge of west and south Asian geographical divisions.

Orta's Mistakes

A feature of Orta's book already pointed out systematically to the best of his abilities by Breyner are the numerous factual mistakes in Orta's descriptions, both of classical and medieval texts and of local languages, plants and diseases. This also applies to those cases like the cholera or pepper that are often presented in the research literature as proof for Orta's new knowledge and his contribution to scientific progress (Costa and T. Carvalho 2013, 6). Syed and Swaminathan compared Orta's description of the disease of one of his well-off patients in chapter 17 with the disease called *murcchi*, the Sanskrit origin of the local term *morxi* used by Orta. *Murcchi*, they say, stands for fainting or syncope. The word is, however, also used in a compound (*murcchatisara*), which describes a different disease called *visuchika* (beset by needles), a symptomatic description of the beginning of the disease with a sharp burning pain in the limbs. Further symptoms quoted from an early modern medical text from South Bihar (Maghada), the *Bhava Prakasha* of Bhava Mishra (sixteenth century?), show close similarities to the symptoms the two physicians list. Hence, Syed and Swaminathan suggest that the disease Orta treated in Goa was what the Ayurvedic physicians called *visuchika*. Since Orta explicitly states that the disease was not infectious and since both his and Bhava Mishra's descriptions miss a key symptom characterizing what today is called *cholera*, the two authors reject identifying Orta and Mishra's disease with epidemic cholera (Syed and Swaminathan 2009, 60–62). In Syed's and Swaminathan's view, Orta's mistake in this case consists in identifying *morxi* with "our Cholera morbus," since in a description of the seventeenth century the symptoms of the latter as well as its treatment differ significantly from the former (Syed and Swaminathan 2009, 62–63).

Županov neatly summarizes Orta's lofty rejection of a druggist's claim that black and white pepper are not different plants, but merely different appearances of one and the same thing. She also notes that in Orta's view knowledge was socially constituted and valued. She points out that Orta's own claim about the two peppers coming from two different trees was false (Županov 2009, 26). This observation does not motivate her, however, to engage in a more profound analysis of the kind of clear mistakes found in Orta's book and their meaning both within the text itself and with regard to the knowledge available in western India during the first half of the sixteenth century. Such a comparative analysis of

these seemingly minor details is necessary if we wish to go beyond the quotation of individually exciting or outstanding sentences or the repetition of individual stories, which merely confirm what we already believe in. These details will help us to understand why Orta went to such lengths as to engage the druggist, the Portuguese viceroy and the Hindu ruler of Kochi in a verbal as well as material competition over an epistemologically difficult issue of botanical classification, which could have been settled, in this particular case, rather easily if all those involved would have waited long enough to see the black pepper indeed turning white, as the druggist had claimed (Županov 2009, 25–26). Orta's triumphalist avoidance of this empirical solution of an epistemological and social question contradicts the widespread praise found in the research literature for his empirical, observational practices. This particular example highlights a more rhetorical usage of the language of experience, observation, eye witnessing and trust by Orta and at the same time, a less simple understanding of such concepts concerning demonstration and investigation.

We must not only simply register the different types of Orta's mistakes, but also ask how these factual mistakes should be interpreted. Should they be interpreted as a reflection of Orta's limited access to books from home, or as an element of his self-representation? He often describes himself as a person who knows most things better than the ancients, the "Arabs," and his colleagues in Europe. But he adds to this rhetorical strategy claims of superiority with regard to medical practitioners in Goa, who had no university degree and ranked lower in the colony's social hierarchy. Or should we consider his factual mistakes as a reflection of the superficiality of his knowledge of local medical texts as emphasized by Grove, Pimentel and Soler?

In research I conducted in Goa in order to find out which scientific books had been available at the convents of Goa in the sixteenth and seventeenth centuries, I read the order and delivery lists of books that were requested to be sent to Goa from Lisbon. I also saw the titles in the National Library of Goa that had physically survived the climate and the centuries. Two results of this investigation struck me most: the lists did not contain scientific books ignoring the rare exception. The surviving items in the National Library did not come in their majority from the libraries of the convents, but from private collections of individual missionaries. Hence, Orta's access to medical books at Goa between 1538 and 1563 was certainly limited. Nonetheless, as Iken and Costa have indicated he knew (of ?) some books newly printed in Europe in the early 1560s (Iken 2009, 82; Costa 2012, 76). His mistakes with regard to books thus can be a reflection of the paucity of books available in town and the need to rely on memory.

Other mistakes concern foreign words. These mistakes reflect the oral character of this kind of knowledge, its location in trade, gardening and alimenta-

tion. They are witnesses to the multilingual society of Goa, in which Orta lived and those, which he encountered as a merchant and when traveling. They document the difficulties in identifying the multiple sounds of the consonants. With very few exceptions, Portuguese knows only one sound for each of its consonants. In contrast, Indian languages have two sounds for most consonants (aspirated and unaspirated). Moreover, the letters *n*, *t* or *ts* are pronounced in three or four different parts of the mouth with different manners of rolling and positioning the tongue, depending on the concrete language (dental, alveolar, retroflex, alveopalatal). The liquids *l*, *r*, and in some languages also *v* (aspirated and unaspirated) are so closely related to each other in pronunciation that it is very difficult for the uninitiated to separate them acoustically. A possible example of this last case is Orta's information that *areá* is the Bengali and Deccani word for *aloe* (Orta 1891, 25; 1913, 6). According to Breyner as well as modern dictionaries of Bangla and Hindi or Urdu, the corresponding words rather are *elia* (Bangla) and *elwa* (Hindi/Urdu) (Orta 1891, 37). Breyner thought that *areá* had to be seen as a corrupted form. It is, however, merely a minor confusion of the two sounds *l* and *i/w* with *r* and *e*.

There are of course numerous differences between the phonological systems of the individual Indian languages, whether Indo-European or Dravidian, which are the only two clusters relevant for Orta's linguistic environment. The mentioned sound types are nonetheless shared across them in most cases. They are those that create most of the problems for an untrained ear. Transforming these sounds into the letters of the Portuguese alphabet in an unequivocal manner was no easy and at times a hopeless task. No surprise then that Orta collapsed all of these sound variants into single sound types, not even differentiating between their aspirated and unaspirated forms.

Other problems with Orta's transliterated Indian words reflect their origins in Portuguese Creole that began to evolve with the first Portuguese settlers in Goa after the city's conquest in 1510. Hence, in order to develop a more precise understanding of Orta's linguistic environment as well as his personal abilities the history of Portuguese Creole needs to be taken seriously. A further issue concerning Orta's orthography of Indian words for plants, drugs or foodstuff is the ambivalent linguistic reality of Indian cities and port towns. Thus unequivocally identifying the language of origin of a particular word might have been impossible for Orta, since he depended on the language practices of his informants.

Mistakes in Orta's text are thus not simple, one-dimensional expressions of his limited range of knowledge of Indian conditions. Nor are they fully explainable by social boundaries between castes, although these forms of obstructing, preserving and containing knowledge will certainly have played their rôle (Grove 1991, 167). Several specific statements in Orta's text speak rather in favor of an

elaborate mix of Orta's knowledge of Latin translations of Arabic medical texts from the eighth to the twelfth centuries, a self-representational desire to devalue certain medical practices such as the treatment of fevers and a lack of familiarity with Persian, Arabic and Sanskrit textbooks of medicine and pharmacology taught and used in western and central India in the first half of the sixteenth century.

Orta's Stories About Indian Therapeutic Practices

Orta claims that in Gujarat doctors starved feverish patients almost to death as a cure (Orta 1895, 140; 1913, 309). Although I do not know much about Ayurvedic therapies, I doubt this report very much given Orta's respective claims about Muslim doctors. But contrary to Costa's and Carvalho's belief that Orta claimed that the Muslim doctors followed Ayurvedic therapy when treating fevers, this is neither what the text says nor what Orta argues about (Costa and T. Carvalho 2013, 5). Orta angrily dismisses the court physicians for being fickle, trying "to indulge the people of the land" instead of following his good therapeutic practice of bleeding and misidentifying the disease of the crown prince whom Orta finally had to bleed secretly with the belated consent of the ruler (Orta 1895, 141–143; 1913, 311–312).

Two, perhaps three, features of his story speak against taking it as a reliable description of medical and social practices at the Nizam Shahi court. While the Muslim physicians at court identified the disease as small pox, Orta does not give his own diagnosis in clear terms. He merely rejects his opponents's views. He presents himself as the only reliable doctor who does not wish to earn money, but always follows the dictations of his profession to do the best for his patients. The accusation that local doctors do not follow a medical doctrine or provide the best for their patients, but rather try to indulge them and bow to their wishes, is not born out from the details of Orta's stories about the Nizam Shahi court. It also is an attack that was leveled in the sixteenth century by other Christian doctors from Europe, when they were in foreign lands, having to compete with their local colleagues and wanting to represent themselves in their writings to their compatriots. One such example is Alpino Prospero's (1553–1617) description of the medical practices and doctrines in late sixteenth century Cairo (Alpini 1591).

A study of the rhetorical components of accounts of foreign socio-medical customs by doctors, trained at European universities, is thus needed for contextualizing Orta's negative comments on his Muslim colleagues in Ahmadnagar. One element of such a study is the observation of how often and in what terms Orta discusses books known to and studied in the various medical cultures of the Iberian Peninsula and western India. The asymmetry of books discussed for the

medical culture of the Iberian Peninsula and those discussed for Goa and the court of Ahmadnagar is difficult to overlook. Orta does not provide a single title of a medical book written in Arabic or Persian after 1100 nor does he mention the title of a medical book ever written in Sanskrit or any of the early modern Indian languages. All he reports about is that the Muslim doctors at the court of Ahmadnagar and a merchant at Goa, Khwaja Pir Quli, were familiar with some of the authors he also knew (Hippocrates, Galen, Aristotle, Plato, Ibn Masawayh, Ibn Sina, al-Razi, 'Ali b. Ridwan), while they did not know others, in particular Ibn Rushd and Ibn Zuhr (Orta 1891, 28, 48; 1913, 10, 23). Plato, however, was not an author widely read by Muslim physicians, except perhaps for his wise sayings. Whether the doctors at the court of Ahmadnagar read Aristotle is unclear, but not very likely. If they wished to read books on natural philosophy they may have read Ibn Sina's *Kitab al-shifa'* in Arabic or his *Danish-nama-i 'ala'i* in Persian or a more recent handbook taught at madrasas.

Moreover, it is highly unlikely that Muslim physicians at Ahmadnagar, Diu, Ahmadabad or elsewhere in the Deccan and along the Indian West coast still used all the texts of the ninth and the tenth centuries. Although I am not aware of a systematic study of the medical authorities used in those cities and courts during the first half of the sixteenth century, my overall experience with manuscript libraries in Hyderabad and Mumbai makes me highly skeptical towards Orta's claims. They rather resemble those of seventeenth-century travel writers from Italy, France or England where we have sufficient documentation on them appropriating this kind of "data" either from Arabic Christians in European cities or from books printed in Latin in Rome, Paris or London, in addition to their familiarity with such short lists of names from their years at university. Hence, Orta's claims about the alleged authorities known to Persian and Deccani Muslim doctors represent more closely his own knowledge acquired on the Iberian Peninsula than local reading and healing practices.

As said above, the extant medical works of Rustam Jurjani and Firishtah provide a good opportunity to acquire an independent view of the knowledge and practices at the Nizam Shahi court of Ahmadnagar as depicted in their work works on drugs, fevers, gynecology and sexual diseases and therapies. Firishtah's *Handbook of Physicians*, for instance, describes, according to Keshavarz, the medical practice "of Muslim physicians in India" (Keshavarz 1986, 109). Its introduction discusses theoretical doctrines, that is, clearly contradicts Orta's claims to the opposite. The first and the second chapter describe simple and compound remedies, which may illuminate what Orta may have learned in Ahmadnagar. The third chapter is about therapy and explains treatments of individual diseases. Its analysis could help to understand Orta's story about his conflict with the court physicians. The postface, called seal, lists information about tastes and describes

the regions of the inhabited world (Keshavarz 1986, 109–110). Hence, Orta was not the first as claimed in Costa's new book who wrote in a medical work about food and its tastes (Costa 2015). The miniature, reproduced here (Figure 4.1) shows that other items created at the court of Ahmadnagar can also be found. Its ascription by art historians to a refugee from Europe may even open further avenues for analyzing Orta's report about his visits to the Nizam Shahi rulers.

Another possible explanation for the absence of any references to early modern Arabic, Persian, or Sanskrit medical texts in Orta's dialogues is the persecution of Hindus and Muslims in Goa and the long list of forbidden activities proclaimed since 1540 by the Portuguese Crown and subsequently the Church in Goa. The vicar-general in office at this time was Miguel Vaz Coutinho. With him, the so-called period of tolerance towards Hindus ended. He was largely responsible for the destruction of many Hindu temples in 1540. In 1546, King John III ordered the search of Goan houses for Hindu religious symbols and their destruction. He also forbade Hindu festivals and public rituals by Brahmins. In 1550, the king passed a law forbidding all Hindu cults and ordered the destruction of the remaining temples. As a result, until 1554, many wealthy Indians, including physicians, left Goa (Mendonça 2002, 275). These violent activities continued under the new viceroy Pedro Mascarenhas who took office in 1554 (Mendonça 2002, 257). In 1563, all remaining Hindu doctors were ordered to leave Goa within a month's time. Four years later, the Church demanded that no Christian should be treated by a Hindu physician, midwife or barber (Saraiva 2001, 348, 350–351; Županov 2002, 19). Although the edicts were often not rigorously implemented, Orta may still have considered it unsafe to report about the study of Sanskrit texts together with a Brahmin.

These two possible explanations and the two conflicting facts on which they rest point to the contradictions between demands and exigencies raised by the secular and religious elites of Goa for controlling the colony's populations and those resulting from the needs to heal sick people and the difference between climates, diseases and remedies that set Portugal apart from Portuguese India.

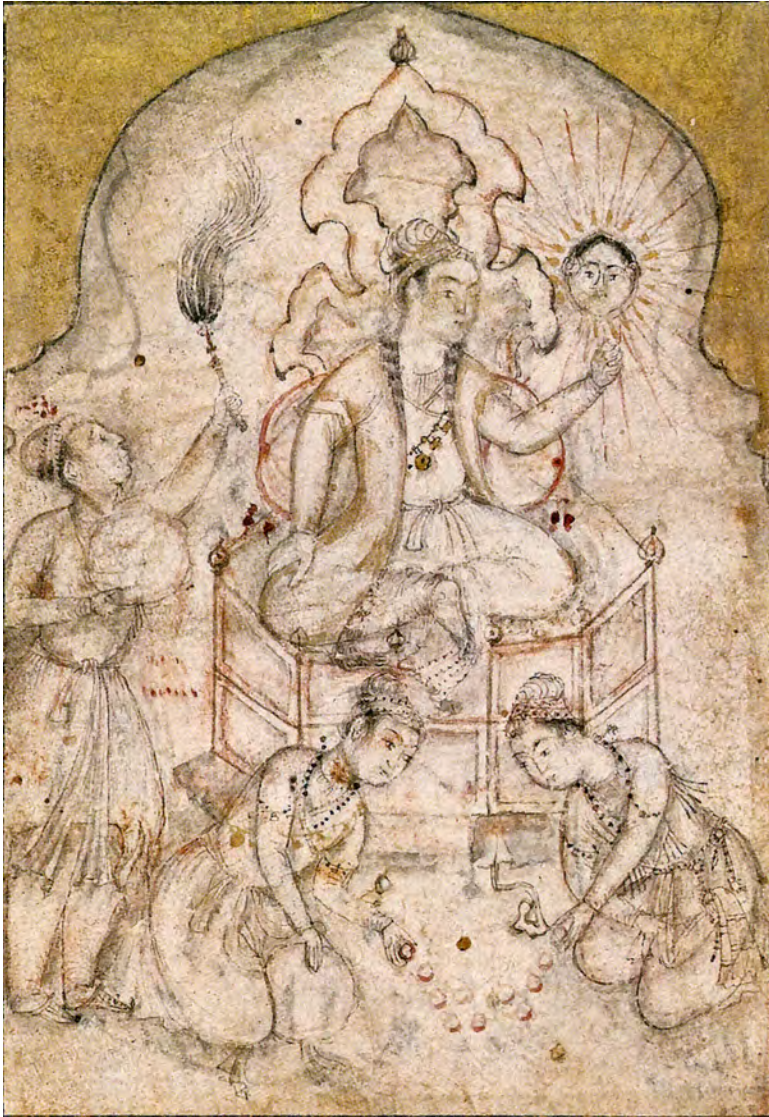


Figure 4.1: An Enthroned Prince (Alexander with a Magic Mirror (?)), Ahmadnagar, Nizam Shahi Court, late sixteenth century, attributed by Mark Zebrowski (1983, 27) to a European painter. The Stuart Carry Welch Collection, Part One, *Arts of the Islamic World*, London 6 April 2011, Sotheby's, p. 119, n° 96.

Orta's Silences and Issues of Violence

The penultimate feature of Orta's text which I wish to discuss here is his complete silence about his entire family who lived with him in Goa since 1548 and about any other living being named by their names except for five Portuguese governors or viceroys, a Zoroastrian merchant who had served the Portuguese in 1534 as interpreter at Diu (Khwaja Pir Quli), two physicians (Malupa, Hindu doctor from Goa and Mulla Ucem (Mulla Husayn), a Muslim doctor from Ahmadnagar), three slaves or servants in his household, the Tuscan administrator of his house and garden in Mumbai, three or four Spanish doctors and apothecaries, one merchant in gemstones from Milan and a single woman of mixed heritage (Orta 1891, 32, 97, 130, 154, 190, 205, 231, 299, 307; 1895, 18, 101, 109, 125, 140, 146, 164, 186, 235, 260, 331–332, 340, 364, 382, 384–390). This silence is intimately linked to the overwhelmingly irenic atmosphere that Orta creates throughout all of his 58 chapters, which I present here as the last remarkable property of Orta's narrative. He reduces conflicts between him and Muslim physicians to mere matters of jealousy and professional incompetence. He does not speak of his encounter in 1558 with the Goan Inquisition in the case of the arrest of his close friend Diogo Soares, which was part of the persecution of 35 so-called New Christians in Kochi and Goa from 1557–1559 (Cunha 1995). Nor does he talk about the bloodshed during the military campaigns or the destructions of Hindu temples and enforced conversions of Hindus and Muslims in Goa.

Several of these silences reflect the danger that emanated from talking about them. This applies in particular to all forms of persecution, since the Portuguese Inquisition had put speaking of them on its list of capital crimes (Saraiva 2001, 126–127). Other forms of violence, however, are standard stories in Portuguese historical chronicles of the sixteenth century. Speaking of battles, victories or sick soldiers was by no means unusual in their texts, some of which Orta certainly had read as his survey of the history of Delhi and the Deccan implies. He also might have met Diogo do Couto (1542–1616), the author of the continuation of John of Barros's (1496–1570) history of Portuguese Asia. Couto arrived in Goa in 1559, took part in a number of campaigns against Gujarat, collected information from Portuguese and Indian soldiers, prisoners of war, merchants and courtiers about the details of many of the battles that took place in the 1530s and 40s (Mathew 1986, 131–142). Hence, writing about military violence and its results was by no means a stigmatized or tabooed subject.

Orta participated as the personal physician of his patron Sousa for about four years in military campaigns along the West coast of India. When he pretends that his experience of these campaigns was mostly entertaining and at worst marred by Sousa's dysentery, he certainly beautified the events and chose to omit most

of their features. Indeed, he rather left it to his young Spanish colleague Dimas Bosque to speak of the consequences of war and disease almost at the end of the book. Bosque arrived in 1558 in Goa as the personal physician of the new viceroy of Goa, Constantino de Braganza (1528–1575), and as the ship physician of his fleet (Orta 1895, 376–377, 384; 1913, 464–465). He told Orta: “When the Viceroy Dom Constantino was in Jafanapatam, owing to the continual labor of fighting and the heavy rains to which the soldiers were always exposed, a great many sickened with dysentery; and their cure always fell into my hands, since there was no other doctor in the fleet” (Orta 1895, 376; 1913, 464). The only other instances of war within the text itself, which Orta mentions very briefly and calmly, were two confrontations with an Ottoman and a Gujarati fleet at Diu in 1539 and 1546 (Orta 1895, 340; 1913, 443). The contrast between Orta’s irenic narrative and the poems by Orta and by Luiz de Camões, which follow the book’s dedication to Martim Afonso de Sousa, is quite clear. There, war is celebrated as a virtue. In Orta’s poem war is hailed as a property of Mars, which Sousa unites in his person with the virtue of the wisdom of Apollo. The bloodstains on his white toga are marks of honor, not to be silenced. Camões’ poem, dedicated to viceroy Coutinho, celebrates the Troian War, which it presents as a metaphor for the Portuguese in India (Orta 1891, unpaginated).

Violence was certainly also an aspect of Orta’s rise from “a poor new-comer” in 1534 to a quickly well-off and later even truly wealthy merchant. He owed his wealth to trade in drugs, spices and gemstones, which at first he undertook in person and later, when he acquired first one, then at least two ships, through a larger network of partners. Orta reports more than once about the phases of his commercial success and some of the merchandise he traded in. Never does he mention, however, any kind of conflict at land or at sea, which in those times were rather ordinary events due to Portugal’s policy of a militarily controlled Indian Ocean (“*mare clausum*”) and the resistance of local rulers and merchant networks against conquest and subjugation, including piracy (Mendonça 2002, 37).

As in the other cases of ordinary, day-to-day violent events, possible reasons for Orta’s decision to avoid referring to them are difficult to reconstruct. The cooperative research project that I recommend with this paper needs to investigate the narrative of Portuguese trade and its major structures in order to weigh the reasons stated below and to propose others more closely related to such narrative standards of the sixteenth centuries.

In my current view, at least three conditions may have motivated Orta’s silence. Firstly, Orta may have abstained from telling his readers more about the sources of his commercial ascent due to the tensions among Goa’s merchant communities and the increasing difficulties that Crown and Inquisition imposed on collaborative work between Portuguese Christians, Jews, Muslims and Hindus,

although the Crown continued to rely on all of these groups when it came to trading (Fischel 1974, 411–412; Saraiva 2001, 130–155, 347–353; Mendonça 2002, 48, 77, 179, 255–260). Often enough, successful commercial cooperation provided the reason as well as the pretense for denunciations and subsequent persecution.

The cases studied by Cunha for the years immediately before the installation of the Goan Inquisition confirm that wealthy merchants were an important element of the persecuted group and that issues of commerce were named in the denunciations (Cunha 1995, 169–175). A second reason might have been the desire to protect his commercial connections from undesired competition. A third reason for Orta's silence about the sources of his wealth and the violent measures involved in its acquisition may have been the accusations leveled against his patron Sousa for placing scores of family members in lucrative and powerful positions in Portuguese India, for usurping too many opportunities for private trade for himself, his clique and other wrong-doings (Subrahmanyam 2012, 97–100). Reminding his intended audience of too many details of Sousa's governorship and their violent results might not have been in Orta's particular interests in the late 1550s and early 1560, when he may have written a good part of his book.

Yet, knowing of their existence and role in Orta's life as well as of the repeated moments of sharp violence between the Muslim rulers of the Deccan and Portuguese governors and viceroys, about whom Orta also talks of exclusively in friendly terms as if they lived together peacefully, without any threat to their possessions, power and lives, is a necessary precondition to see the asymmetry of Orta's narrative creation of a life of peace, friendship, social rise and successful patronage relationships. The presence and absence of concrete acts and forms of violence in his descriptions of Goa, Kochi, Ahmadnagar, Diu and other localities in western India is thus one possible key for a better understanding of Orta's life and his overt and covert goals when compiling his book. This pattern of narrating together with the breadth of his silence speak loudly for Orta's intentional construction of these features of the text. For a long time, they have irritated me deeply, and I did not understand their rationale. After having read Saraiva's and Cunha's books, as well as the seventeenth-century travel account by Charles Delon, a French victim of the Goan Inquisition, I came to see Orta as someone who belonged to a family who had already at least once been in the clutches of the Inquisition. His way of storytelling agrees with the rules that Saraiva describes for such families teaching their children how to behave in a future arrest (Saraiva 2001, 124–128). In his book, Orta clearly emptied his life in India from most of the people who shared it regularly or temporarily. He obviously adopted it in order not to endanger (any further) his family, friends and acquaintances. Orta's narrative thus appears in its overall structure as an Inquisitorial product, a testi-

mony to the power that this all-pervasive institution has had over all inhabitants of Portuguese India.

Conclusions

My investigation of recent articles and book chapters by historians and historians of science or medicine on Orta and his book confronted me with different readings of and approaches to the latter's work. The impression that I took from this reading is that many recent writers do not engage closely enough with Orta's text. They do not deal with its contradictory claims, its rhetorical forms or its medical, botanical, linguistic and historical technicalities. As a result, many claims are made that contradict Orta's explicit statements, while ignoring many others. A careful reading of Orta's book shows that he was neither the progressive hero of positivist historiography nor the multicultural, open-minded egalitarian of post-modernist beliefs. Rather, his text is, in parts, a product of the repressive atmosphere of his times and the narrative strategies that victims of the Inquisition were forced to learn if they wished to survive arrest and torture. Orta's text also reflects the profoundly asymmetric sociocultural relationships between Portuguese, Muslim and Hindu doctors with formal education and a literary canon as well as between such formally educated doctors and medical craftsmen like apothecaries. Orta's choices of language, style, arrangement and naming as well as his misunderstandings, false interpretations and disinterest speak loudly against a simple and glorifying interpretation of the author as a hero of recent ideological, political, religious and methodological camps. Orta was much more traditional, parochial and condescending than has so far been recognized. His text is certainly a narrative about Indian plants and drugs, but only partly so. Orta created for himself a monument of respect and appreciation, a text in which he is without doubt the central figure and the only hero. His choices of platforms of action, mostly his house in Goa, the Nizam Shahi court at Ahmadnagar, and to a much lesser degree the environment of Portuguese governors or viceroys, highlight this centrality of Orta's self-representation.

My analysis is, however, and can only be a beginning. If we wish to do justice to man and text, we need to organize a cooperative venture that combines the many different skills and knowledge forms that I have tried to outline in my paper. A central precondition for a successful research in such a cooperative venture is that we determine our prejudices and presuppositions in order to avoid them and enable us to overcome the one-sided, glorifying tendencies of previous research.

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Chapter 5

Transferring Natural Knowledge in Early Colonial New Spain from Franciscan Sources: Motolinía's *Historia de los Indios de la Nueva España* (1541–1569)

Emma Sallent Del Colombo

Introduction

Fray Toribio de Benavente, Motolinía (ca. 1490–1569), arrived in New Spain in 1524 with the first expedition of friar minors, known as “the twelve,” headed by Friar Martín of Valencia (ca. 1474–1534).¹ He belonged to what we might call the first generation of Franciscan chroniclers. Together with Andrés de Olmos (ca. 1485–1571), the author of *The Chronicles of Michoacán* (xvi c.) and Bernardino de Sahagún (ca. 1599–1590), author of the *Historia general de las cosas de la Nueva España*, they gathered news about the peoples of New Spain, their customs and habits, as well as any information about natural history: animals, plants, minerals and *materia medica*. Several years later, Jerónimo de Mendieta (1525–1604) would draw from Motolinía's work, as well as that of others, when writing his *Historia eclesiástica Indiana* (ca. 1590–1604).

Thanks to the great wealth of information that they provide about pre-Hispanic populations, both Motolinía and Sahagún have been regarded as “avant la lettre” ethnographers and their work defined as “enquêtes ethnographiques” by historians such as Georges Baudot (1971)² and other authors of the French school. Edmundo O’Gorman, however, in his critical response essay to G. Baudot’s doctoral thesis, claimed that this view was, “though not totally inaccurate,” somewhat anachronistic in that it obscured the authors’ true purpose. He remarked sarcastically: “it is a little like calling the activities of marital love ‘gynaecological research’” (O’Gorman 1977, 377). More recently, Serge

¹In fact, they were not the first Franciscans to arrive in the New World. Before those who accompanied Cortés on his expedition, Pedro de Gante had arrived a year earlier along with Juan de Tecto and Juan de Aora.

²Miguel León Portilla has also called them “pioneers of anthropology”; see, for example: León Portilla (1999) and Bustamante (1989), among others.

Gruzinski has endorsed this point of view, stressing the political and strategic purpose behind these friars' efforts to gather so much information:

Les moines du Mexique ne sont pas des ethnologues avant la lettre ou des « pionniers de l'anthropologie » même si leurs enquêtes semblent s'apparenter à la recherche ethnographique. Le rapprochement est anachronique et il déforme le rôle historique que ces moines ont exercé au sien de la Monarchie. [...] Les savoirs qu'ils acquièrent et les interprétations qu'ils échafaudent ne cessent d'être étroitement soumis à des objectifs politiques et religieux, puis qu'ils ont mission d'effacer le paganisme et d'extirper les idolatries. (Gruzinski 2006, 182)

The ultimate aim of both Sahagún and Motolinía's writings was to put an end to what they saw as the Mesoamerican inhabitants' idolatry, and the basic way to do this was to accumulate knowledge. It was essential not to overlook any detail of social organization, politics, history, beliefs, languages, as well as botany, zoology, skills, "natural philosophy" (Gruzinski 2006, 183) and *materia medica*, in order to separate the acceptable from the unacceptable in the beliefs and behavior of the local population.

In Sahagún's case, the painstaking and encyclopedic collection of even the smallest pieces of information which might enable the new friars to seek out any trace of idolatry in the practices and discourse of the Indigenous population, as they slipped back into, or rather, never truly renounced their ancient divinities, is particularly striking. In comparison, Motolinía's *Historia* is more discursive and optimistic and less encyclopedic than Sahagún's. We shall return to a comparison of their work later on.

The "spiritual conquest" (Ricard 1986) would not have taken place, therefore, "sans des esprits intimement familiarisés avec le monde indigène" (Gruzinski 2006, 181). The information gathered by the friars was to prove very useful in planning the strategies to spread religious beliefs. Nonetheless, this process was not free of misunderstandings and transpositions, which only superficially seem to demonstrate the surrender of the local people to the new demands. The imposition of supernatural Christian elements on the Indigenous populations proved, as Gruzinski observes, easy and at the same time insuperable:

Aisée, parce qu'en dépit des distances considérables qui les séparaient, les deux mondes s'accordaient à valoriser le surnaturel au point d'en faire la réalité ultime, primordiale et indiscutable des choses. Insurmontable, car la façon dont ils le concevaient, différait à tous égards. [...] Sur la croyance, que d'une manière

générale les Indiens interprétèrent comme un acte, au mieux un transfert d'allégeance à une puissance nouvelle, supplémentaire. (Gruzinski 1988, 239)

Despite this and other misunderstandings,³ there was a transfer of techniques, knowledge and strategies between the local population and the newcomers. Motolinía's *Historia* gives us an idea of the knowledge, which circulated, flowed, was transferred and adapted.

In taking this step, one which Ricard (1986, 26) regretted not having taken in his book, namely that of considering the friars' works to not only be primary sources for the history of New Spain and its settlers, but also vehicles for the transmission of thought, keys to deciphering religious orders' control and power strategies, it also becomes clear that they are privileged witnesses of the resistance and voices of the local population, something which is harder to find in other types of work. The subject of *Historia* by Motolinía, or in general, the chronicles of religious orders in the New World, which are not thought *a priori* as works of natural history or medicine, contain indirect testimonies and clear traces of these sorts of practices. In other sources more focused on describing the preparation and practical uses of various substances or compounds, these traces can sometimes be impossible to gather. It could be said that the Indigenous voice creeps into the descriptions supposedly put together to instruct and control the local population and the missionaries. The missionaries had the task of taking care of the body in order to cleanse souls. We shall comment briefly on some general elements of the work before examining the particular aspects that interest us here.

Motolinía's *Historia de los Indios de la Nueva España*

Although the matter is still a topic of historiographical debate (O'Gorman 1977, 413), the work in the existing form, or in other previous works modified by other hands, is attributed to Friar Toribio de Benavente, known as Motolinía. The same author also left us *Memoriales*, which constitutes another version of *Historia*. According to Phelan (1973, 122), Edmund O'Gorman's edition/reconstruction of *Memoriales*, which includes fragments from *Historia* and some others from manuscripts handled by Alonso de Zorita⁴ as well as others spread around dif-

³Mignolo (1994). On the transposition of concepts, see also the introduction by Claudio Esteva-Fabregat, Motolinía (2001, 51).

⁴Alonso de Zorita was a judge and official at the Real Audiencia de Santa Domingo and later of New Spain. Baudot (1971, 21) remarked: "Parmi les chroniqueurs ayant usé (et abusé) de cet écrit, il en était un particulièrement important, en raison de l'extension de ses dettes à l'égard de l'ouvrage du franciscain: l'auditeur Alonso de Zorita. On avait de lui une *Breve relación de los Señores de la Nueva España* peut-être bien connue, mais son oeuvre principale: *Historia de la Nueva España*

ferent chronicles, constitutes ‘the edition’ and changes the preeminent role until now held by *Historia* in relation to *Memoriales*.

Basing himself on the biographical writings by José Fernando Ramírez, O’Gorman put forward a list of reasons for questioning the attribution of *Historia*, as we know it today, to Motolinía.⁵ In his opinion, it should rather be seen as a text based on this author’s writings. The fundamental reasons that he gives are: errors with Náhuatl etymology, errors with events in the Franciscan calendar and several anomalies in the text of *Historia*. Given that our concern here is not of a philological nature, but relates to gathering relevant information about the circulation and transmission of practices and *materia medica*, we have used the most recent edition of *Historia* for the present study, edited by Claudio Esteva-Fabregat (Motolinía 2001, 5–50).

Motolinía vs. Sahagún

It is not our aim here to discuss Sahagún’s work and we shall restrict ourselves to remarking on some parallelisms and divergences in the two Franciscans’ works, which might prove useful for a better understanding of the extracts from Motolinía.⁶ Neither of the two works came to light until long after they were put together⁷ and the philological-historiographical reconstruction of the different versions and even their authorship remain an ongoing historiographical problem, as we previously commented on with regard to Motolinía.

In Sahagún’s case, the manuscripts were actually scattered, brought together again and finally withdrawn from circulation by royal order in order to prevent the diffusion and resurgence of the idolatrous knowledge that the author had striven to combat in the first place.⁸ To try to explain the publishing difficulties faced by these works, Ricard introduced some linguistic considerations related to the imposition of teaching Spanish to the Indigenous population. This measure was unpopular with the friars, who argued that they were already struggling to cope

n’avait été éditée que pour un quart de son texte. Déjà en 1931, le P. Atanasio López tentait une esquisse de reconstruction de l’ouvrage de Motolinía, aidé par ce quart de texte (Primera Parte), et signalait l’énorme intérêt de poursuivre dans cette voie quand on aurait la possibilité d’extraire des trois autres parties inédites du MS. de Zorita les abondantes et précises références à Fray Toribio.”

⁵Ramírez (1859). O’Gorman cites the 1957 edition, p. 166.

⁶For a detailed study of this case as an example of the creation and circulation of scientific knowledge around the Colegio de Santa Cruz de Tlatelolco in the context of convents as scientific spaces in the XVI Century New Spain, we recommend Pardo-Tomás (2013).

⁷For the various editions of Motolinía’s work, see Motolinía (2001, 51–53).

⁸Gruzinski (2006, 184) writes on this subject: “La Couronne alarmé de voir circuler informations, décide de confisquer les manuscrits et geler les enquêtes.” Gruzinski continues in a footnote: “Ce qu’exige en avril 1577 le roi Philippe II quand il interdit que l’oeuvre de Sahagún circule ou s’imprime et qu’il ordonne au Viceroy.”

with all the other tasks given to them, and in all likelihood saw the added linguistic divide as a means of containing and controlling the local population. Moreover, the ban on publishing in Náhuatl and other languages undermined the friars' strategies for developing closer ties with local people (Ricard 1986, 126). All of this occurred, despite the declared interest in Sahagún's *Historia general de las cosas de la Nueva España* for the purposes of the Inquisition (Gruzinski 2006, 184).

Sahagún and Motolinía, disagreed, however, over how to achieve this aim and the former launched several tirades against the twelve friars who, having been duped by the "vulpine" attitude of the Indigenous population, had not had the wit to make use of "serpentine prudence":

He was often vexed by the contradictions that he was made to suffer from back in his teaching days in Tlatelolco, first by those who challenged the teaching given there to the Indians and later by members of the church, when he turned his attentions to researching the antiquity of the land, a long time before receiving, it would seem, the order from P. Toral to write *Historia*. How far they went may be inferred from what he says in the prologue to book VI: "In this book it will become clear to see that those emulators who have claimed that everything written in these books before and after this one is fiction and lies, talk like fanatics and liars." It is very striking that that he hits out not once but several times at the first twelve clerics, accusing them of lacking *serpentine prudence*, and holding them responsible for the false conversion of the Indians. (García Icazbalceta 1896, 283)

García Icazbalceta⁹ also raised some very interesting questions in relation to the controversy:

Did he have any particular grudge against them? Did they take part in the contradictions? There is no information to make any claims: what we discover is that Sahagún's opinions were entirely opposed to those of Motolinía. The latter was wary of unsettling the Indians by seeking out idols (p. 284) that they had forgotten about, as if they had been around a hundred years ago.¹⁰ (García Icazbalceta 1896, 283)

⁹Joaquín García Icazbalceta (1824–1894). Mexican, writer, historian and bibliographer.

¹⁰The paragraph by Motolinía to which Icazbalceta refers is about "digging up idols." See Motolinía (2001, 299 [455]).

The Order's internal tensions, partly revealed by the difficulties in the preparation of Sahagún's work, culminated in Sahagún's denouncement of a calendar attributed to Motolinía before the Inquisition in 1572, four years after the death of the last of the 'twelve':

[...] the contradiction did not end there, but took on greater substance after Fr. Toribio compiled an indigenous calendar, which Sahagún proposed should be impugned. He did so in very harsh terms, as can be seen in the appendix to book IV of *Historia* and in the prologue to *Arte Divinatoria*, (2) where he says that he wrote a condemnation of a newly invented calendar, made by the first friars themselves, with one in particular, (3) "Confuting it and proving very effectively the fabrication created and the fiction with which these first preachers were deceived." He had already stated in the appendix to book IV that it was all "false, totally false, mere fiction, a great lie and a very harmful falsehood."¹¹

García Icazbalceta concluded by virtually "accusing" Sahagún of betraying one of the most relevant "apostles." The underlying cause of the controversy is unknown, but we believe it is worth reflecting on the denouncement of the "overly optimistic" attitude of Motolinía's account, which did not perhaps share the need to publicize some of the Order's failures in the conversion effort.¹²

Accepting that the Indigenous population had returned to idolatry or, worse still, had never really abandoned it, implied, in reality, acknowledging the failure of the first friars' efforts, something that Motolinía did not appear to be ready to agree to, let alone divulge. In the context of conversion strategy, we believe that Motolinía should not be regarded as being "naive" but rather as a strategist. He considered the friars' task to be huge and although he thought it vital to denounce the outrageous treatment of the Indigenous population by the Spanish, he believed that harsh criticism like Sahagún's could undermine the work undertaken at such high personal cost by the Franciscan fathers, and even demotivate those called upon to carry out their mission.

With regard to the overall strategy for converting, the key role of knowledge and expertise related to *materia medica* and natural history can be seen. Accordingly, we shall now try to trace the circulation of skills and knowledge vital for

¹¹García Icazbalceta (1896, 283). Icazbalceta explained that he had information suggesting that Motolinía was the father referred to. The document would be published in Baudot (1991) years later. Gruzinski (2006, 231) also refers to this fact.

¹²This interpretation could provide arguments for understanding the open rejection of and bitter controversy with Las Casas de Motolinía. See "Investigaciones sobre el origen y motivos de sus disidencias con De Las Casas" for a scholarly and detailed discussion of the subject in Ramírez (1859).

structuring the strategy of spiritual conquest and maintaining political control, which, as we remarked on earlier, fed off a knowledge of local culture and the transmission of knowledge brought from the Old World.

In the next paragraphs of this work we will therefore analyze the elements of Motolinía's *Historia* that enable us to outline more clearly the natural history and New Hispanic medicine of the first half of the sixteenth century. Central to this analysis of these aspects will be the concepts of cultural misunderstanding, appropriation and transposition, all of which are useful interpretative keys for understanding how the global strategy of the clergy in New Spain was put into practice.

Medical Practices: Bloodletting, Surgeons and Midwives

The difficulties that the first friars found in transferring supernatural Christian concepts to the Indigenous population are diametrically opposed to the ease with which they managed to adapt technical and traditional knowledge; Gruzinski thus defines it as: "La mobilisation des savoir-faire indigènes" (2006, 88). He cites Motolinía:

En 1543, le chroniqueur franciscain Motolinía dresse un bilan enthousiaste : « On ne comptait plus les Indiens forgerons, serruriers, fabricants de freins, couteliers ». Depuis que le charpentiers sont arrivés d'Espagne avec leurs outils, les Indiens travaillent comme les Espagnols » en acquérant les techniques européens, les « naturels » se familiarisent avec de nouvelle matières : la laine, le cuir, le fer, le papier, les pigments d'origine espagnole. (Gruzinski 2006, 89)

He highlights the friars' role in the acquisition of these skills by the Indigenous population, referring in particular to the chapel of San José de los Naturales in San Francisco, Mexico:

De façon aussi paradoxale qu'inattendue, les Indiens font apprentissages, grâce à l'appui des hommes d'Eglise, en principe exclusivement voués à l'action missionnaire. Si les moins soulignent si souvent l' « habilité » des Indiens dans les « métiers manuels », s'ils sont si conscients de la valeur des traditions artisanales des indigènes et admirent tant leur savoir-faire, c'est bien qu'ils ont joué un rôle déterminant dans la transmission des nouvelles techniques européennes ou dans l'adaptation de celles qui existaient déjà à leur arrivé. (Gruzinski 2006, 89)

The Indigenous population swiftly mastered the artisanal and artistic techniques of the metropolis that overlapped and enriched local skills and practices, which were in turn reinterpreted by the Spanish, who were forced to adapt to the lack of certain facilities which life in the New World entailed.

An example of such shared or appropriated practices appears in the description of the type of sacrifices that the Indians undertook to honor their gods:

As well as the sacrifices and these festivals, there were many other particular ones which they held constantly, especially those ministers that the Spanish called popes. These made sacrifices on many occasions of parts of their own bodies, and in some celebrations made above their ears using a small black stone knife [a hole] which they took out like a blood lancet, and so sharp and with such keen edges; (Motolinía 2001, 104 [103])

The blood lancet was one of the instruments used to cut very finely. Other utensils used were wheat reeds or the tips of *maguey* or *metl*:

Returning to the matter at hand, I say: that through that hole which they made in their ears and in their tongues they passed a reed as thick as the finger of a hand, and as long as an arm; many of the common people, both men and women, pulled through or along the ear or the tongue straws as thick as wheat reeds, and others tips of *maguey*, or *metl*, (which will be explained at the end), and everything that they took out was bloodied, and the blood that they were able to collect in some papers, they offered before the idols. (Motolinía 2001, 104 [103])

The Spanish appropriated the sharp instrument and used it to let blood with varying degrees of success. In the New World, they had to adopt practices “that in Spain would not be deemed worthy of being learnt”:

[...] and thus many Spanish are bled and bleed others with them, and they cut sweetly, though occasionally they become blunted if the bloodletter is not a good one; over here everyone makes sure

they know how to let blood and brand and many other skills.¹³
(Motolinía 2001, 104 [103])

Motolinía devoted several pages to the Indians' sacrifices to their gods. Without giving too many technical details, he comments on the utensils used to remove hearts, which were not sharp like the blood lancet, and mentions that a very large number of victims were subjected to such "operations."¹⁴

The dividing line between ritualistic procedures and practices with medical purposes is blurred, and any therapeutic connotations are not always obvious. There are certainly references to the intervention of native surgeons, at least on the battlefield:¹⁵

They had respected people available to take care of people wounded during battle, who saw to everything and carried them to where the surgeons were with their medicines, and there they healed and cared for them. (Mendieta 1973, 79)

What does seem clear is that anatomical dissections, a standard practice among metropolitan physicians and surgeons in the sixteenth century, were also performed in New Spain.¹⁶

It is not easy to know the customs of the local population in regard to these types of practices, as once again we have to rely on the written accounts of missionaries. This being the case, it is necessary to screen the information left by them with the awareness that what they chose to transmit was conditioned by their own particular ends.

¹³The lancets were also used for shaving and cutting hair. See Mendieta (1973, vol. II, 36): "And they quickly produce from these stones, in the manner described, about twenty or more knives. These have almost the same handiwork and shape as the lancets with which our barbers let blood, except that they have a spine running through the middle and are charmingly somewhat curved at the end. They'll cut and trim beards and hair with them and the first time and the first cut, with more or less a sharp blade; but at the second cut they lose their edge, and then it takes several times to shave off the hair or the beard, although in truth they are cheap, and they'll give you twenty of them for a real. Finally, Spanish lay people and clerics have shaved with them on many an occasion."

¹⁴In Mendieta (1973, vol. I, 62) we also find a description of these practices: "and then they raised them up in their temple, where with great care the "Pope" (which they called *Papaua*) and priests dressed up in their emblems, laid them out, breaking their backs on a slab that had been erected for it; and then with a flint made of wood for making knives, this Pope struck him in the chest so skilfully that the heart came out, and was shown to him before he died, and they offered it later to the sun and the idol in whose honour they were making the sacrifice [...] And so that they would not feel death so much, they gave them some concoction to drink, which seemed to dull their senses and allow them to go happily to their death."

¹⁵On pre-Hispanic medicine in Mesoamerica, see Montellano (1990) and López Austin (1988).

¹⁶Pardo-Tomás (2012, 186–196). See also López Austin and Viesca (1984) and Viesca Treviño (1986, 1998, 2003).

Births and the role of women in them are another example of health care practices of particular interest in Motolinía's account¹⁷: midwives were everywhere, since all women had the necessary knowledge to assist in births. They washed their children in cold water and many reared in this way were known to grow up "well and healthy." Spanish women, by contrast, "brought to delivery too soon and under duress" were put at risk and "left worn out and shattered" and in many cases could not give birth again:

If one of these Indians is giving birth, she has the midwife close to hand, because they are all midwives; and if its her first time, she goes to a neighbor or relative for help, and waiting patiently for nature to take its course: they give birth with less work and pain than our Spanish women, many of whom for having being put to deliver too soon and straining hard, have been put at risk and are left worn out and shattered, unable to give birth again; and if the children are two in one womb, they are not given milk for a calendar day, or in some places two, and the mother takes them afterwards, one in each arm, and breastfeeds them, and they do not die, nor do they look for a wet nurse to suckle them, and later on each awakes to her breast; not even for the birth do they have *torrejas* ready, or honey, or other gifts, but rather the first thing she graces her children with is a wash in cold water, without fear of harming them; and with all this we see and know that many such babies brought up naked like this live to be well and healthy, and handsome, robust, strong, happy, nimble, and with all the skills required of them; and most importantly of all, seeing that they have come in God's knowledge, they have little to prevent them from following and keeping the life and law of Jesus Christ. (Motolinía 2001, 129 [140])

In addition, there female "experts" who were also consulted in order to obtain potions, herbs or other substances, for interrupting pregnancies.¹⁸ These figures—who appear in Motolinía's account as assistants in the *autos sacramentales*

¹⁷Sahagún (1830, 36) also talks of the skills of a typical woman devoted to medicine: "she is very familiar with the properties of herbs, and roots, trees and stones, and has great experience in knowing them, and is not unaware of many secrets of medicine. She who is a good physician knows very well how to cure the sick, and for the good she does them she almost brings them back from death to life, seeing that they recover or convalesce, with her cures. She can let blood, administer a purge, give medicine, apply ointment to the body, soften hardness in it by palpating it, reset bones, lance and heal well ulcers, gout, the evil eye, and cut away skin that remains stuck to the bone [...]"

¹⁸Another interesting reference in Sahagún's description of the "Adulterous woman": "The adulteress [...] has bastard children, and with potions she is made to vomit and miscarry [...]" Sahagún (1830, 37).

(allegorical religious plays) performed in New Spain¹⁹ and the way they are portrayed by the author offer us an interesting connection with the study by Angélica Morales Sarabia.²⁰ As Morales Sarabia points out, this was a process of the construction of ignorance, which penalized and ultimately succeeded in consigning this knowledge, patrimony of the Indigenous population's medical practices, to oblivion.

Attitude Towards Illness

Motolinía also describes the different attitude of the Indians and the Spanish towards illness. With regard to the differing outlook of the two groups, he compared some “Indians” who were “very uncomplaining” with some Spaniards who ruined themselves to pay for the apothecary and the physician:

If some [Indian] has a headache or falls ill, if some physician might easily be found among them, they go to see him, without much fuss or cost, and if not, more patience than Job; it is not like in Mexico, where when a neighbor who is suffering and dies, having been in bed for twenty days, has to use all his fortune to pay for the apothecary and the physician, leaving hardly anything for the burial; and with all the funeral orations and pauses and vigils that strip away so many entitlements, or torts, that his wife is left in debt, and if the wife dies the husband is left helpless. I once heard a married man, a wise man, say that when either of the couple fell ill, with death being a certainty, then the husband should kill the wife, or the wife kill the husband, and one should strive to get the other buried in any cemetery so as not to end up being poor, alone and in debt; these people spare themselves all of these things. (Motolinía 2001, 128–129 [139])

It is worth highlighting the presence of native physicians who did not restrict themselves to healing the Indigenous population, but who also cared for and healed the Spanish (Motolinía 2001, 182 [252]). These practices also took place in particular places of medicine, such as hospitals, as we shall see in the next section.

The healing methods, in which the friars played the leading role, had a component, which, as we shall now see, sometimes went beyond the powers and realms of nature. Gruzinski stated—referring in particular to Franciscans like

¹⁹See, for example, Schuessler (2009). For a well-documented study of performances of edifying theatre in Mexico, see Horcasitas (1974), cited in O’Gorman (1977, 381).

²⁰See chapter 7 by M. Sarabia.

Motolinía, Sahagún and the archbishop Montufar—that the first church was hostile to miracles, in keeping with an optimistic, even triumphalist conception of evangelization, which given the Indigenous population’s keenness to receive the faith, rendered any miraculous intervention superfluous, and even saw in it the secret but unquestionable influence of Erasmism. He acknowledged, however, that miracles hardly waited for the closing of the Council of Trent or the arrival of the Jesuits or even the installation of the Holy Office (1571) to occur in Mexican territory. “The first Franciscans themselves had visions, practiced levitation and revived some dead, contrary to the assertion of Motolinía” (Gruzinski 1988, 190).

As we mentioned earlier, this viewpoint warrants some qualification. Although we share, of course, the idea that the “hagiography of miracles” continued *in crescendo*²¹ as the sixteenth century wore on, we do not feel that Sahagún and Motolinía can be viewed in the same way, since it was precisely this “optimistic” attitude that was heavily criticized by the former, and, in fact, Motolinía himself put forward different cases of miraculous healing in his *Historia*.

Although the friars treated the superstitious attitudes of the local population with suspicion and condemned them, they frequently resorted to miracle cures and many other series of actions that had to do with supernatural intervention. These practices were often related to the administering of sacraments such as baptism or confessions before dying:

The constant and biggest work done with these Indians was in confessions, because they are so continuous that the whole year is a lent, at any time of day and in any place, both in churches and on pathways; and above all it is the never-ending sick people; whose confessions make a lot of work; because as illnesses offend them, and many of them never confessed, and charity requires that they be helped and laid out like someone who is *in articulo mortis* so they may go to their salvation. Many of them are deaf, others covered in sores, and confessors in this land, by the way, cannot be delicate or squeamish to suffer this role; and many days there are so many sick that the confessors are like Joshua praying to God that he should hold back the sun and lengthen the day so that they may finish taking confession from the sick. [...] what is baptising, marrying, confessing if not marking servants of God, so that they are not harmed by the avenging angel, and those who are marked may work to defend and deliver them-

²¹ This is also very evident in the Augustine case. Compare the Chronicle by Juan de Grijalva with the continuation by Esteban García (1918).

selves from their enemies to prevent them from consuming them and finishing them off? (Motolinía 2001, 215 [306])

Baptism was another of the moments in which religious practice and care for the sick coincided (Motolinía 2001, 158 [202]): “not only on Sundays or days that are set aside for this, but also on any normal day, children and adults, the healthy and the sick, from every region” came to be baptized:

Thus many have come, and many from far away, to be baptised with children and wives, the healthy and the sick, the lame and the blind and the dumb, dragging themselves and suffering very hard work and hunger because these people are very poor. (Motolinía 2001, 160 [205])

Public interventions were also made on requirement with important members of the local aristocracy:

In Mexico, a son of Motezuma’s asked to be baptised, who was the great lord of Mexico, and as his son was ill, we went to his home, which was right where the church of San Hipólito is now built, [...] They brought out the sick man to be baptised on a chair, and when during the exorcism the priest said: *ne te lateat sathana*, not only the sick man but also the chair in which he was so upright started to shake in such a way [...] (Motolinía 2001, 158 [202])

On other occasions the miracle was achieved with the “habit and cord of San Francisco (Saint Francis)”:

[...] this people of natural Indians is so hunched over and silent that for this reason they are unaware of the many [196] and great miracles that God works amongst them, more than I see coming to wherever [there is] a house of our father San Francisco many sufferers from all kinds of illnesses, and many very dangerous ones, and seeing them returning so joyfully recovered and healthy to their homes and lands, and I know that in particular they feel special devotion to the habit and cord of San Francisco, with whose cord many pregnant women have delivered themselves from very dangerous births, and this has taken place in many villages and many times; and here in Tlaxcala it is very common, and only a few days ago we had experience of it; for this reason the gatekeeper has a cord to give to those who come asking for it, although I rather believe that the devotion that the cord enjoys is as much at work as the virtue that lies

in it, although I also think that the virtue is not inconsiderable [...].
(Motolinía 2001, 195–196 [277])

The devotion to San Francisco and the friars was even capable of reviving the dead:

In a village called Atlacubaya [now Tacubaya, a *colonia* or neighbourhood of Mexico City], near Chapultepec, from where the water that flows to Mexico springs, which is a league away from Mexico, lay ill a son of a man named Domingo, a tezonqui by trade, which means carpenter or stoneworker, who along with his wife and children are devotees of San Francisco and his friars; one of his children of about seven or eight years old fell ill, [...] they came to our monastery invoking the name of San Francisco, and the worse the child's illness grew, the greater became the parents' insistence on requesting the saint's help and favour; and as God had ordained what was to be, he allowed the child Ascensio to die; he had died one day in the morning two hours after sunrise; and even though dead, his parents did not cease in floods of tears to call on San Francisco, in whom they trusted so much, and as it was now gone midday, they wrapped the child in a shroud, and before they did so many people saw the child was dead, and cold, and stiff, and the grave open. [...] his parents say today that they always had hope that San Francisco would resurrect the boy, obtaining God's pity for the boy's life. And since when it was time to take him for burial, the parents once again called on and prayed to San Francisco, the boy started to move, and they promptly started to untie and unfurl the shroud, and so came back to life he who was dead; [...] This miracle as I write it down here, I got from Friar Pedro de Gante [...]. (Motolinía 2001, 196 [278])

The friars used looking after the physical health of the Indigenous population as an excellent excuse to also take care of their spiritual health. Diverse conceptions of health and illness coexisted in the realms of medical practice.

Places of Medical Practice

Hospitals

Institutions of medical practice, such as hospitals, were fundamental elements in “the medicine of conversion” (Pardo-Tomás 2013; 2014a; 2014b), which gave the structures of the “architecture of conversion,” that is, church, atrium, open

chapels plus convents, schools and hospitals, a broader valence if they are regarded as spaces for communication and the circulation of knowledge and medical practices, instrumental in the “spiritual conquest of New Spain.” It is just one of the aspects of deployment that the monastic orders carried out with aim of conquering and converting the Indigenous population. A global understanding of the power of this deployment of means is not possible without a correlated analysis of the diverse aspects and practices which coexisted in these articulated spaces for the transfer of knowledge between missionaries and natives related to caring for the body, inseparable from caring for the soul.

The friars needed to develop strategies for attracting and involving the local population in their project of Christianization, with the participation of a series of figures who cooperated in educational-health tasks and the conversion of the native people. Territorial reorganization was one of the key elements in controlling areas and people, and in some cases artificial villages were even created to gather children together, given that they were so important in the task of conversion:

Fearing that, once returned to their families, the children brought up in monasteries would go back to paganism, a special village was set up for them, four leagues from Mexico, not far from Coyoacán, and there they were grouped around the convent, in such a way that they could easily keep the Christian faith intact in them.²²

The convents set up throughout New Spain and acceded to by diverse religious orders—“the friars also made sure that churches were built everywhere” (Motolinía 2001, 80 [59])—were places of repose and shelter for members of the Order; the convents and hospitals were also established, however, with the idea in mind of political control over this space, inextricably linked to the purpose of evangelizing, in order to both safeguard the health of clerics, troops and colonists, and accommodate the sick and the dispossessed.²³

The hospital was “reasonably well-equipped and prepared to care for the poor,” and had no reason to feel envious of Spanish hospitals.²⁴ There people responsible for collecting offerings, among which gifts of wax were particularly abundant and in sufficient quantity for a whole year’s supply (Motolinía 2001, 127 [137]). The alms delivered to the hospitals for the poor were not only given out *in situ* but were also distributed “a league around,” thus strengthening the centralization of power and control in the hands of the friars:

²²Ricard (1986, 235, note 22). Letter from the Audiencia de México to Carlos V, 14 August 1531, in CDIAI, XLI: 84ss.

²³For details of the role of the convent as a space for creation, mediation, communication and the circulation of medical knowledge, see Pardo-Tomás (2013).

²⁴For information on hospitals in New Spain see, for example, León-Portilla (1990); Ruiz-Llanos and Campos-Navarro (2001); Muriel (1956); Venegas (1973).

The first thing they did was prepare very good alms for the poor Indians, who not just settling for those that they had at the hospital, went around the houses a league around. They shared out many loads of corn, and many *tamales* (*typical dish consisting of a corn-based dough stuffed with meat or vegetables*) instead of *roscas* (*pastry in the shape of a large doughnut*), and the deputies and *majordomos* who went to distribute it refused anything for their work, saying that it was them who should offer their services to the hospital, rather than take from it. (Motolinía 2001, 135–136 [151])

The hospitals were also supported by donations from the Indigenous population, who worked in them and scoured the province in search of sick people.

The Indians have made many hospitals where they care for the sick and the poor and they provide abundantly for their poverty, because as there are many Indians, although they only give a little, a little bit from so many makes for a lot, and more so as it is continuous, and thus the hospitals are well supplied; and as they know how to serve so well that it seems they were born to it, they want for nothing, and from time to time they go all over the province to look for the sick.²⁵ (Motolinía 2001, 182 [252])

Of great interest to us is the fact that the native physicians working in the hospitals knew “how to apply many herbs and medicine” and in some cases had “so much experience” that they were even able to cure the Spanish:

They have their physicians, from among the experienced natives, who know how to apply many herbs and medicines, who are good enough for that; and among them some of them have so much experience that many old and serious illnesses, which Spaniards have suffered for many days without a remedy being found, have been cured by these Indians. (Motolinía 2001, 182 [252])

Nature and Naturalia

Materia Medica and Natural Histories

Sahagún’s work, in particular, but also Motolinía’s, with regard to the descriptions of natural history, represent, as Gruzinski argued, histories, in the sense the term “history” had at their time:

²⁵See also Bechtloff (1993).

The Covarrubias dictionary defines history in these terms: “in broad terms what is known as history is the history of animals, the history of plants, etc. And Pliny entitled his great work [...] natural history.”²⁶

One of the most obvious differences between the pages of Sahagún’s eleventh book devoted to *naturalia* and the fragments of natural history in Motolinía, is that Sahagún describes²⁷ in great detail the medicinal purposes of plants, minerals and preparations to treat this or that illness, in a way which is more reminiscent of a medical handbook.²⁸ Motolinía’s account, on the other hand, outlines the general uses of plants and rarely dwells on descriptions of medical particularities.

We would now like to focus on some fragments of the work directly related to *materia medica* and the transfer of knowledge to demonstrate the interest and richness of Motolinía’s “historia natural.”

Description of Natural Products from Here and Over There and Their Uses

We find in Motolinía’s descriptions examples of exotic Oriental *materia medica* being compared to Western material, probably gathered orally by some local “expert” or “connoisseur.” Interest is shown in the use of Western material as a substitute for oriental material:

Pepper trees are found in these hills, which differ from those of Malacar because it does not burn so easily nor is it fine; but it is a milder natural pepper than others. There are also cinnamon trees; it is whiter and thicker. (Motolinía 2001, 241 [354])

He also describes that Indigenous people used substances, such as sweetgum, which had “medicinal qualities,” thus transferring useful knowledge to the evangelizers and colonizers:

There are also many mountains of sweetgum trees, they are beautiful trees, and many of them very tall; their leaf is like the leaf of an ivy;

²⁶Sebastián de Covarrubias, *Tesoro de la lengua castellana o española*, (1611), edition Madrid Turner (1972, 692), cited in Gruzinski (2006, 182, note 9).

²⁷See, for instance, López Austin (1974).

²⁸García Icazbalceta (1896, 181) in his biography of Sahagún comments that it would be rather possible for Sahagún to have written a *Doctrina para los Médicos*. Sahagún was a teacher at the Tlatelolco College, where medicine was one of the subjects taught. García Icazbalceta writes furthermore that the Franciscan writer was keen on experimenting with Indigenous medicines. For proving his argument, the biographer refers to Sahagún, *Historia* (vol. III, 300, 303, 305). García Icazbalceta, nevertheless, was mistaken, as these pages refer to Sahagún’s description of experiments with metals and stones and no references to the teaching of Tlatelolco are made. See also Pardo-Tomás (2013).

the liquor that they get from it is named sweetgum by the Spanish, it has a smooth smell, and has medicinal qualities, and is valued by the Indians; [...] they mix it with its bark so that it will set, as they do not want it in liquid form, and they make loaves of bread wrapped in some large leaves, they use it for fragrances, and they also treat certain illnesses with it. (Motolinía 2001, 241 [354])

Or there was the prized balm that the natives “were already making before the Spanish came,” in particular “chilozuchil,” which “is already tried and tested”:

There are two types of trees from which balm comes and is made, and a big quantity is made from both types; from one of these types of trees, called the chilozuchil, the Indians make the balm and they were making it before the Spanish came; this one made by the Indians is somewhat more odoriferous, and does not go as dark as that made by the Spanish; these trees are to be found along the banks of the rivers which flow down from these hills to the North Sea, and not to the other side [...]. This balm is precious, and they use it to cure and heal many illnesses; it is made in few places; I think that is the reason that they still don't know these trees, in particular that chilozuchil which I believe to be the best; because it is already tried and tested. (Motolinía 2001, 241–242 [354])

Also of great interest is the role of the Franciscan friars as “acclimatizers” of European fruits and medicines, as in it we see the two-way transfer of knowledge and techniques:

There are wild cassia fistula (Golden Shower trees). [...] This tree was planted on Española Island by the friar minors, before anyone else planted them, and here in New Spain it is the friars who have planted nearly all the fruit trees, and persuaded the Spanish to plant them too; and they taught many to consume them, which is the reason why there are so many and very good kitchen gardens, and there ought to be many more; because seeing that the land produces a hundred times what they plant, the Spanish are very given to planting and consuming good fruit and well-regarded trees. (Motolinía 2001, 242 [355])

Many of the trees found in New Spain were not “known to the Spanish until (then).” An example was one variety of the maguey (agave) and its medicinal uses, which Motolinía himself claimed to have “seen being tried”:

It is very healthy for a slash or a fresh ulcer, taking one of its main ribs and throwing it on the embers, and taking the hot juice is very good for the bite of a viper; small *magueyes* should be used, the size of a palm, and the root is tender and white, and the juice taken and mixed with the juice of the wormwood of this land, and when the bite is washed, it heals; I have seen this being tried and being real medicine: that is, when the bite is fresh. (Motolinía 2001, 295 [444])

Motolinía mentioned also the sleep inducing and healing properties of the *picietl*:

There were [...] very many snakes; these were bound and the fangs, or teeth, removed, because the majority of them were of the viper variety, a fathom long, and as thick as a man's arm at the wrist. The Indians take them in their hands like birds because they have a herb for the wild and venomous ones which makes them sleepy or numbs them, which has many medicinal uses; this herb is called *picietl*. (Motolinía 2001, 132 [145])

This is a true natural history from which only a few fragments have been highlighted, and which can be grouped together in accordance with the “taxonomy” of “natural histories.”²⁹ They form part of the body of knowledge compiled by the friars, who used natural elements in their descriptions of information that was of possible use to other clerics in the task of evangelization, and of interest to the readership in the Old World, in the style of the Franciscan friar Diego Valadés’ *Rhetorica christiana*. Like this author, Motolinía had also set out to write not so much a catalogue, as an extensive account of natural things in New Spain:

I sometimes had it in mind to write and say something about the things that there are in New Spain, both natural and grown in it, like those that have come from Castile, how they have been made in this land, and I see that because of the lack of time this is patched up, and I couldn't properly satisfy the intention with which I had set out initially; because many times my thread is broken by necessity and the charity with which I am obliged to aid my fellows, who I am compelled to console at all times. (Motolinía 2001, 240 [351])

Conclusion

The fragments from the *Historia de los Indios de la Nueva España* that we have seen here reveal how very useful it is to look at this work from a different viewpoint, focused on tracing healthcare practices and *materia medica* in New Spain,

²⁹See José Pardo-Tomás, chapter 2 in this volume.

understood as a transfer of knowledge between the local population and the colonizers, and the key role of the medicine of conversion to understand the scope of the political and evangelizing strategy of the friars in the first half of the sixteenth century, in New Spain.

Motolinia's *Historia* has given us the opportunity to study the transfer of technics and knowledge between local population and newcomers. Through the analysis of medical practices, attitudes toward illness, spaces of medical practice, *materia medica* and natural history, we are able to consider how this knowledge was adapted and transformed in an intercultural process that could be understood as a part of a competition between systems of understanding trying to find their way to a common and systematized new order of information.

A central role in this dynamic system of production and adaptation of knowledge is played by the core concept of "conversion medicine," which takes into account both natural and supernatural experiences and activities carried out by friars in their spiritual conquest of bodies and souls.

This article forms part of a broader project, the aim of which is to study the chronicles of religious orders, also taking into account the first Dominican and Augustinian friars to reach New Spain, in order to outline a more complete and detailed overview of the religious strategies of spiritual conquest, and in particular, the dual role of evangelizers as healers of the body and the soul, and key players in the transfer of both medical-healthcare knowledge and natural knowledge.

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Chapter 6

Global Cross-Cultural Dissemination of Indigenous Medical Practices through the Portuguese Colonial System: Evidence from Sixteenth to Eighteenth-Century Ethno-Botanical Manuscripts

Timothy D. Walker

Portuguese colonial exploration and settlement from the fifteenth to eighteenth centuries included a significant dimension of medical inquiry, the impact of which resonated throughout learned European society and well beyond. Early commercial contacts with native peoples and sustained missionary activity, combined with pragmatic attempts to address threats to the health of European settlers in the tropics, occasioned Portuguese medical-botanical prospecting in Africa, India, the Persian Gulf, China, Malaysia, Indonesia and South America. Such pioneering experimentation added extensively to human knowledge about, and understanding of, traditional indigenous healing practices and pharmacological botany. The enduring impact of these tentative inquiries in matters of medicine and natural philosophy has long outlasted the transient economic importance of the Lusophone maritime empire. In an unparalleled feat of knowledge acquisition and dissemination, Portuguese colonial agents brought indigenous drugs and information about native healing methods back to Europe, but also spread such diverse commodities and novel techniques to colonized territories around the planet.

Systematic Portuguese maritime exploration and settlement in the tropics began along the west African coast in the 1420s, predating by far any other comparable state-coordinated European effort; consequently, Portuguese exposure to tropical diseases, as well as various indigenous methods of treating them, lasted far longer than that of any rival European seafaring nation.¹ Early practical necessity, combined with long familiarity and compelling mercantile considerations, resulted in the Portuguese tendency toward being especially receptive to the widespread adoption and dissemination of indigenous medical practices, becoming perhaps more reliant on them than their European counterparts. Through

¹Boxer (1991, 1, 14–29); Disney (2009, xix–xxii); Newitt (2004, 10–34); Russell-Wood (1992, 8–24); Winius (1995, 10–16).

diverse commercial, ecclesiastical, and professional medical channels, knowledge of indigenous botanicals and healing techniques circulated throughout the Portuguese-speaking world and beyond during the colonial era, enriching medical resources in European imperial enclaves around the globe. In sub-Saharan Africa, as in Brazil and their Asian trading enclaves, Portuguese medical practitioners encountered radically different spheres of healing knowledge, shaped by each region's unique ecological and social context. The Portuguese would explore, exploit, expropriate and export these bodies of native medical experience for more than three centuries.

But what were the practical mechanisms of this exceptional transfer and diffusion of knowledge? Portuguese descriptive works—manuscript reports and field guides about Asian and South American medicinal plants in particular—informed Europeans for the first time about many of the efficacious drugs commonly employed in indigenous healing traditions. Portuguese colonial agents (missionaries, merchants, military officers, medical practitioners, colonial administrators) sent not just consignments of indigenous drugs, but also codified reports with detailed information about various native healing substances and methods, back to Europe, as well as to other colonized territories (Walker 2009). Thus, European agents across the Portuguese trading system, by interacting with native groups encountered during their seaborne expeditions, were pioneers in this specific process of knowledge transfer: a protracted cross-cultural collaborative procurement focused on healing. Entirely new epistemologies of medicine evolved through, and as a consequence of, the sustained Portuguese colonial experience during the early modern era.

A variety of interrelated motives animated Portuguese efforts to gather medical information during the age of exploration and colonization; separating these into distinct threads of causality is not easy. First, we might point to the pure profitability of exotic medicines. Europeans valued many spices from Asia for their medicinal as well as culinary applications; to contemporaries, the Portuguese term *droga* (“drug”) was effectively synonymous with “spice” (Russell-Wood 1992, 129). Fortunes were at stake, and this drove a determined—at times rapacious—search for new medicinal substances. Maintaining territorial power, too, depended on the ability to keep settlers and soldiers fit in the tropics. In Asia and Africa, due in part to a dearth of population resources at home, the Portuguese colonial grip was chronically weak and precarious, so healing knowledge rapidly gained a strategic imperial dimension. For Christian missionaries, developing and demonstrating superior healing prowess with local remedies gave an advantage in their evangelical endeavors; saving lives evolved quickly into

a deliberate strategy for winning converts and saving souls.² During the opening phases of Portuguese empire building, such practical motives and immediate concerns took precedence over any purely intellectual considerations. Medical explorations driven solely by an interest in botany or natural philosophy were rare, and would not occur in the Portuguese sphere in any methodical way until the late eighteenth century (Walker 2013). Detailed information about the global botanical networks of the Portuguese Empire, which came into being earlier and were far more diverse geographically, ecologically and culturally than those of any European rival, is conspicuously downplayed in (or nearly omitted from) most historical accounts that consider the biological consequences of maritime colonization (Crosby 1975; 1986; Schlesinger 1996). Few historians of medicine (Lusophone historiography excepted) have examined in detail the effect of protracted Portuguese exposure to indigenous healing ideas, or why Portuguese colonial institutions or organizations tended to be remarkably receptive to the adoption and dissemination of native medical practices in their African, Asian, and South American enclaves.³ Indeed, as researcher Sonja Brentjes points out in her contribution to this volume, even Portuguese historians of medicine have discounted or entirely ignored important contributions to Portuguese colonial-era medical practices that originated in predominantly Islamic regions, such as the Persian Gulf, Red Sea or North Africa.⁴ Thus, this work aims to add appreciably to a scholarly understanding of how healing knowledge was transferred from one culture to another within the Portuguese colonial context.

This paper will examine direct primary evidence for how that transfer and diffusion of medical knowledge occurred by focusing on numerous descriptive ethno-botanical texts produced in Portuguese colonies during the early modern period. It will consider the worldwide implications of such media for the transfer and evolution of healing practices in the Lusophone world, exploring the role of these texts as conduits of multicultural medical knowledge, wherein European and Middle Eastern, Indian, African, Malaysian, Indonesian, Chinese and South American concepts about healing were transmitted and often blended. In so doing, this work engages key questions treated in the work by António Barrera-Osorio (2013) namely, how do useful native methods or wisdom “jump” cul-

²Before admission to the Order, all candidates for the Company of Jesus were required to undertake at least one month of practical hospital training, and as missionaries were expected to attend to the health of their community. See O’Neill and Dominguez (2001, 2601–2602) and Leite (1953, 83–89). See also the Shembaganur Province Archives, Sacred Heart College, Kodaikanal, Tamil Nadu, India; Annual Jesuit Missionary Letters of the Maduri Province; Shelf 211, Book 34 (1606–1643), pp. 30–44, 47–50, 52–53 and 78; also Shelf 211, Book 102 (1655–1666), pp. 87–91 and 221–227.

³In English, key recent works include Maehle (1999); Schiebinger (2004); Weaver (2006); Cook (2007); Delbourgo and Dew (2008); Bleichmar et al. (2009).

⁴See chapter 4 by S. Brentjes.

tural boundaries during colonial encounters, and at what point does circulated “information” about indigenous practices and healing substances become part of an established European body of “knowledge”? Barrera-Osario considers these problems in the context of knowledge about medicinal plants that originated in the Spanish colonies in the Americas, from whence it moved to continental Spain, on to the Netherlands, and generally across Europe. Barrera-Osario sees in these sixteenth-century knowledge transfers an incipient practical empirical method, which led in time to a fully manifested Scientific Revolution. As we shall see, the Portuguese experience was analogous, but the impact of some rare works remained restricted to Lusophone regions, and so they were not as directly influential on scientific thought in northern Europe.

By the mid-seventeenth century, practical medicine in Portuguese colonial enclaves had become thoroughly hybridized, with applied remedies in colonial health institutions (whether state-sponsored or religious) relying significantly on indigenous medicinal substances and methods, derived from various disparate native healing traditions (Walker 2009, 266–270). This paper considers these missionary and medical practitioners’ texts, their intermingled medical cosmology, and the colonial environment that placed so much importance on the remedies supplied through indigenous healing plants. Further, the adoption of various medicinal plants cultivated in Portuguese colonial hospital gardens (often far from their native lands of origin), and an understanding of their applications and effects, depended on the blended colonial social context in which medical practitioners who employed these plants operated.

Exchanges of medical knowledge in colonial settings occurred on a variety of levels; in any given case, much depended on the preexisting conceits and knowledge, skills, and requirements of the individuals directly involved, be they European colonists, indigenous peoples, or non-European workers brought by the Portuguese into contact with disparate native peoples in a context of colonial demographic comingling (Russell-Wood 1992, 106–122). In the missionary context, protracted exchanges aimed at creating religious converts were often substantially more complex—and intellectually more profound—than those rapid transactions conducted between sick Portuguese soldiers, bandeirante explorers deep in the bush, a harried colonial provincial official, or even a ship’s or regimental surgeon, and the native Hindu *vaidyas*, Muslim *hakims* or animist shamans with whom they interacted (Walker 2013). Merchants seeking purportedly efficacious drugs in colonial market places constitute another dimension of medical knowledge procurement; healing commodities had to be sound (apparently unadulterated and with a reputation for efficacy) in order to attract buyers and yield sustained profits. Like their martial or mercantile coreligionists, Jesuit priests and lay missionaries often relied on indigenous cures to treat their own

tropical maladies contracted in the service of the Church; however, their greater patience and investment of time for evangelizing ends usually resulted in a more subtly nuanced and detailed cultural and medical understanding of regional healing methods (Santos Filho 1947, vol. 1, 48–50 and vol. 2, 26–30).⁵

Throughout the initial “first contact” period of dynamic cultural blending and information exchange that occurred in any given colonial setting (c. 1440–1580, but varying according to region), Portuguese military and missionary operational considerations typically fueled interest in indigenous medical practices. At the outset, inquiries into local healing folkways often grew from an immediate, pragmatic European need to treat injuries and unfamiliar tropical diseases. Mercantile considerations provided a close secondary motivation for medical prospecting; commerce in healing plants grew as the colonial system expanded and matured (Chambers and Gillespie 2000, 228–231). Thus, systematic use and dissemination of indigenous medicinal plants collected or cultivated specifically for that purpose began almost immediately, usually as a consequence of first contact, and increased soon after permanent colonial settlement began (Henriques and Margarido 1989, 75–77).

Indeed, mariner’s accounts from the earliest Portuguese explorations show that identifying useful local medicines and remedies was a top priority. Sailors on Pedro Álvares Cabral’s voyage (1499–1500), during the first Portuguese contact with Brazil, carefully observed how indigenous South American peoples consumed roots, nuts, berries, seeds and fruits, employing them for health and sustenance.⁶ In 1511, an apothecary of the royal household, Tomé Pires, was sent to Asia specifically as an agent to seek and secure drugs and remedies; toward this end he was made chief of the first European diplomatic mission to the Ming Chinese court (Cortese 2005, vol. 1, xviii–xlv and vol. 2, 512–518). In 1518, Portuguese merchant traveller Duarte Barbosa described the thriving spice and drug markets at Basra and Ormuz, Persian Gulf trading ports, with an eye toward developing trade in such medicinal wares (Dames 2002 [1918–1921], 88–90, 90–95). These expeditions, after all, were commercial ventures, the ultimate objective of which was to obtain spices and drugs in Asia; official crown expedition orders typically dictated that such voyages seek similar practical, fungible commodities, including specifically medicines, at every anchorage or port of call.⁷ In the colonial military sphere, the exigencies of survival—keeping personnel losses

⁵ Also Shembaganur Province Archives; Annual Jesuit Missionary Letters of the Maduri Province; Shelf 211, Book 34 (1606–1643), pp. 30–44, 47–50, 52–53 and 78, Shelf 211, Book 102 (1655–1666), pp. 87–91 and 221–227.

⁶ “Letter of Pedro Vaz de Caminha to King Manuel” (1 May 1500). In Greenlee (1995, 24–25, 28–29, 59–60).

⁷ “Fragment of Instructions to Pedro Álvares Cabral when he went to India as Commander of a Fleet” in Greenlee (1995, 169–185); see also pp. x, 56–57, 91–94.

through disease or injury to a minimum—drove additional inquiries into potential benefits of native medicine.⁸ In part because of a clear necessity to reduce disease and wound casualties among sailors, soldiers, settlers, and slaves⁹—strategic human resources whose loss far from home could not easily be compensated—Portuguese healing practices in the colonies displayed a tendency toward utilitarian experimentation. That is, colonial medical practitioners were far more eclectic and open to indigenous practices than were contemporary physicians and surgeons in continental Portugal, especially if native drugs seemed to promise or demonstrate genuine effectiveness.¹⁰ Due to severely limited conventional European medical resources in their colonial enclaves and sustained exposure to indigenous methods, Portuguese medical practice throughout the empire was less rigid and more experimental than that taught according to the notoriously inflexible curriculum of Coimbra University, home to Portugal's sole academic faculty of medicine during the early modern period.¹¹ Until long-overdue reforms, introduced by royal compulsion in 1772, rationalized and revitalized instruction at Coimbra, medical professors were obliged to resort to rote recitation of archaic commentaries on the writings of the ancient and medieval authorities: Galen, Hippocrates, Rhazes, and Avicenna.¹²

That said, in the cosmopolitan port cities like Lisbon and Porto, there was considerable openness to new medical knowledge among some physicians and surgeons—especially those who had served in the colonies and returned home with practical experience and a cache of tropical medicines to use or sell, or who maintained correspondence with colleagues (often “New Christian” conversos fleeing Inquisition prosecution) who had left Portugal in the seventeenth and eighteenth centuries to practice or study in Britain, France, the Netherlands or Russia. In Lisbon, the *Todos-os-Santos* (“All Saints”) Royal Hospital trained physicians and surgeons in applied medical techniques, often with reference to methods learned in the colonial tropics (Walker 2005, 103–107, 118–134). All Saints was

⁸The Hospital Militar de Goa was founded in 1520 with this specific purpose in mind, Fonseca (1994, 228). In 1588, post commander Jerónimo de Quadros noted an insufficient and unreliable supply of opium for his men as one of the principle challenges in his administration of the fortress of Comorão in the Persian Gulf; Public Records Office, London, SP89/2, ff. 166–203 (I am grateful to Professor Felipe Fernandez-Armesto for this reference); Historical Archive of Goa (hereafter HAG) *Monções de Reino* (hereafter MR) 115, ff. 88r–89r.

⁹Seventeenth-century author Ambrósio Fernandes Brandão refers specifically to indigenous medicines used in attempts to cure Europeans in Brazil and their African slaves, whose deaths he deemed to be economically damaging for the colony. See Fernandes Brandão (1987, 107–113). The original manuscript is held in the Biblioteca Nacional de Lisboa, Portugal.

¹⁰Juan Pimentel (2000, 23–25) also notes this tendency for scientific innovation to be more active in the early modern Iberian colonies than in the metropole.

¹¹António Barrera-Osorio (2008, 178–180) notes a similar qualitative difference between the colonies and metropole in the spirit and experience of naturalist or botanical inquiry.

¹²For further discussion on this point, see Walker (2005, 99–103).

notable for having a ward specifically dedicated to the treatment of tropical diseases, as early as the sixteenth century, the remedies for which typically included imported native medicines.¹³ These circumstances tended to counter the conservatism of Coimbra's outmoded course of medical study. In the colonies, pressing need overcame prejudice and religious conservatism; far from restrictive institutional oversight, medical experimentation flourished in Goa, Macau and Salvador da Bahia. Through the normal flow of colonial commerce and personnel, such innovative adaptations of non-western medical substances and practices gradually made their way to the metropole.¹⁴

Early Portuguese Transfer of Information about Asian and Indonesian Drugs to Europe

Garcia da Orta, *Coloquios dos Simples e Drogas e cousas medicianais da Índia...* (Goa: Colégio de São João, 1563)

Some telling insight into how information about indigenous medicine traveled by word of mouth, manuscript and printed text in the Portuguese colonial world can be found in the seminal descriptive dialogues about Asian medicinal plants written by the famous Iberian colonial physician Garcia da Orta (Goa, 1563 [1563]). This publication, and the various subsequent unauthorized versions of his text, introduced Europeans to many of the medicinal plants and drugs commonly employed in Eastern healing. Although a range of Asian medicines had been known in Western Europe since ancient times, Garcia da Orta's work—a detailed, critical assessment of the effects of drugs found in the East Indies compiled firsthand, on site, using native sources—conveyed a significantly more profound and nuanced understanding of their original uses and characteristics as indigenous healers understood them.

Garcia da Orta, born into a “New Christian” converso family, trained in medicine at Salamanca and practiced medicine in Lisbon before entering the service of the Portuguese crown and sailing to Goa in 1534, where he remained for the rest of his life. Orta served as the personal physician to several Viceroys and Governors of Portuguese India, as well as to the Sultan of Ahmadnagar. He

¹³ Carmona (1954, 498–507). See also Pires and Vaz (1991, 168).

¹⁴ Júnia Ferreira Furtado (2008, 27–130) describes the rise of a distinct “colonial empiricism” through material and intellectual exchanges between Luso-Brazilian barber-surgeons, indigenous peoples and African slaves who were intent on collecting and testing plants and drugs; the barber-surgeons in Brazil often used their direct knowledge of South American flora to increase their authority over medical practitioners in Europe, highlighting their own actions and obscuring the contributions of Amerindians or Afro-Brazilians who had originally provided their information.

enjoyed the friendship and professional collaboration of Hindus, Muslims and Christians alike (Ficalho 1983, 221–247, 281–285; Russell-Wood 1992, 83–84).

The culmination of Orta's labors, *Colloquies on the Simples and Drugs and medicinal things of India*, saw rapid and wide distribution in Europe. Published in Goa in 1563 (only the second European book to be printed in India), this treatise remained the definitive work on Asian medicine in the Portuguese maritime empire until the nineteenth century. The full text was published only in Portuguese, which limited its circulation. However, the prominent botanist Charles L  cluse (Clusius 1567) translated much of Orta's original material into Latin, reformatted it entirely (dropping the dialog structure), and published it without permission in Antwerp in 1567. Incomplete editions in English, French, and Italian followed (Alves Dias 2013). L  cluse also later appropriated and reprinted work from the Portuguese physician and botanist Cristov  o da Costa, whose *Tractado de las drogas y medicinas de las Indias Orientales*, published in 1578, followed Orta's work closely, but expanded upon and corrected some of Orta's information (da Costa had traveled more broadly throughout the Portuguese Estado da   ndia than had Orta, so he was able to better report on the efficacy and use of some medicinal plants) (Russell-Wood 1992, 149–150). The Dutch merchant-traveler Linschoten included significant information about Asian medicines, all cribbed from Orta's book, in his exceptionally popular work about India (Amsterdam, 1596) (Huyghen van Linschoten 1596; Burnell and Tiele 1885). Thus, through translations and appropriation, the knowledge about Indian medicine contained in Garcia da Orta's original treatise quickly achieved broad circulation in Europe.

Colloquies on the Simples and Drugs [...] of India contains thorough notes about fifty-nine different drugs and medicinal preparations, all of them either native to India or observed in use there during the author's perambulations. "India," of course, is broadly defined; for Orta and his European contemporaries, the geographical area of the Indies comprised much of Asia and Indonesia. Moreover, in its presentation of information about South Asian medical techniques and remedies, Orta's work is essentially an Indian text, despite having been collected and recorded by a Western physician (Grove 1995, 77–80). That is, the book carefully records, preserves, and conveys a distinctly indigenous outlook toward healing, even if viewed through the filter of Orta's interpretation. The *Colloquies* emerged from Orta's personal friendship and professional interaction with a range of medical practitioners in western India, from Malayali-speaking Brahmin doctors in the port cities of Kerala, to Gujarati and Deccan physicians he encountered in Bombay, to lower-caste Hindu healers at Goa and Ceylon (Markham 1913, ix; Ficalho 1983, 221–247, 281–285).

Orta credited Malayali medical practitioners and their Ayurvedic-influenced medicine with being of particular importance to his own training. Throughout his

text, Orta maintained usage of many Malayali words for medicinal substances because “this was the first land [I] knew” (Ficalho 1983, 97). However, his medicinal specimens at Goa were collected and catalogued by a local Konkani-speaking “slave girl” named Antónia—circumstances that inevitably shaped Orta’s perception of the contours of indigenous medical culture in the region where he made his home (Cagle 2012, 181–187; Markham 1913, xiii).

Crucial to the interpretation of Garcia da Orta’s text, however, is appreciating the dual role that the book served. In addition to being a didactic pharmacological work, it is a commercial catalogue of medicines, meant to stimulate demand in Europe for the substances it describes. Garcia da Orta also engaged actively in the vending of medicines; his own fortunes depended in no small measure on these sales. He arrived in Goa with a large personal consignment of drugs from Europe, for which he knew there would be a ready market in India (Cook 2013). Writing his *Colloquies* was thus undertaken with two purposes in mind—to teach and to sell. As with later Portuguese texts that disseminated indigenous knowledge about healing, be they imprints or manuscripts, separating these two intertwined motives is impossible.

The Society of Jesus and the Dissemination of Indigenous Medical Knowledge

Missionary priests were typically among the first learned Portuguese to penetrate the interior of colonized coastal regions. Among the various brotherhoods, the Society of Jesus developed a well-deserved reputation for mastering indigenous languages, customs and especially medical knowledge, and for conveying that knowledge around the Lusophone world. In Asia, they established their first missionary infirmaries or pharmacies at Goa, India and Macau, China in 1542 and 1563, respectively; (Saldanha 1990, 46–48) in Brazil, the Jesuits arrived in Salvador in 1549 and founded a mission settlement near present-day São Paulo in 1554 (Santos Filho 1947, vol. 1, 337; Smith 2002, 3). As outsiders in a strange tropical disease environment, the Europeans often found themselves dependent on the assistance of indigenous medical practitioners to heal them of regional maladies or afflictions.¹⁵ From their earliest experiences in Africa and Asia, missionaries recognized that native cultures harbored a great store of folk knowledge about local medicinal plants, many of which seemed to exhibit efficacy and commercial promise. The same intellectual proclivities that led missionaries to study indigenous languages and customs—strategic knowledge for winning conversions—led them to gather detailed information about native healing arts: traditional local remedies and their natural ingredients. Within a generation of initial

¹⁵Santos Filho (1947, vol. 1, 48–50; vol. 2, 26–30). See also BNRJ, I–15, 02, 026, ff. 1–280.

Portuguese occupation, missionaries began to write and circulate protracted descriptions of indigenous healing plants, including advice about how to identify, prepare and apply native drugs.¹⁶

As a core component of their evangelical activities, most missionary orders founded infirmaries and apothecaries in colonial enclaves throughout the Luso-phone world to treat the sick and help win conversions. There they gathered, compounded and dispensed imported or local drugs, and sold prepared remedies using ingredients procured from Europe, India, Brazil and other Portuguese imperial regions.¹⁷ Taken together, such remedies represented a gradually developing fusion—a distinct Luso-colonial medical culture.¹⁸ Anywhere across the Luso-phone world, this process of syncretism followed a similar pattern.

Over time, the Jesuit missionary brotherhood in the Portuguese colonies developed and codified the primary European body of expertise about a vast range of indigenous medicines. Recognizing the potential for profit from commercializing native drugs, the Jesuits quickly became the principal vendors and disseminators of these healing commodities, and the specialized knowledge of how to prepare and use them, throughout the Portuguese maritime world. They systematically gathered empirical and practical ethno-botanical information, beginning almost from the moment of their arrival in colonized regions in the sixteenth century. Their multiple extant manuscript field manuals from various periods and locations detail indigenous medicinal plants and remedies with striking precision. In addition, these works evince a remarkable respect for local healing knowledge, and even a subtle though tacit regard or admiration for indigenous epistemological conceits.¹⁹

In continental Portugal during the early modern period, missionary orders, or monastic institutions and the colleges associated with them, dominated the apothecary profession at the hub of the empire, and so controlled a virtual monopoly of the lucrative trade in medicinal substances. In the case of medicines arriving from Brazil and the Estado da Índia, Jesuit druggists (*boticários*) in particular enjoyed a clear advantage, as they could rely on their co-religionist

¹⁶See, for example, the Bibliothèque nationale de France (Paris), Department of Manuscripts, Fonds Portugais No. 59, *Breve compendio de varias receitas de medicina* (1598), ff. 2–79v; also BNRJ, Brazil; Manuscripts Division; No. I–15, 02, 026, *Curiosidade; Un Libro de Medicina escrito por los Jesuitas en las Misiones del Paraguay en el año 1580*, ff. 1–280, and Archivum Romanum Societatis Iesu (ARSI, Rome, Italy), Opp. NN. 17, *Colecção de Varias Receitas e Segredos Particulares das Principais Boticas da Nossa Companhia de Portugal, da India, de Macao e do Brazil* (1766), pp. 1–494.

¹⁷For examples drawn from the *Estado da Índia*, see HAG No. 9477, ff. 43, 58, 90 and 141. See also HAG 7887, ff. 2v, 7r, 9v and 40–43.

¹⁸For a discussion about the conceptual problems raised by use of the term “hybridity” see Burke (2009, 34–65).

¹⁹See BNRJ, Brazil; Manuscripts Division; No. I–15, 02, 026.

associates in Salvador da Bahia, Goa and Macau to procure and ship consignments of medicinal plants or prepared medications to their brethren throughout the Portuguese-speaking world. The Jesuit brothers trafficked in all types of indigenous remedies on a truly global scale, sending consignments of drugs between Brazil, Africa, India, China, and Europe. The market for colonial medicines in continental Portugal was largely their exclusive domain for over two hundred years (Sousa Dias and Rui Pita 1994, 18, 21).

For a comparative view of the commercialization of medicinal substances in the Spanish colonies in the Americas, consider the analysis offered by researcher Stefanie Gänger for this volume. In the Spanish context, crown authorities maintained a much tighter and direct control over trade in medicines from the empire. Instead of missionary orders' apothecaries, colonial medicines available in Spain were handled largely but not exclusively by Madrid's Royal Pharmacy, which had "privileged access to medicinal plants and plant-based remedies from the crown's American possessions" (Gänger 2015). The Spanish Royal Pharmacy had been founded during the initial stages of American colonization to cater to the health of the monarch, the royal family and personnel of the royal court, but by the eighteenth century this institution controlled most of the registered trade in prepared medicines from the Spanish New World territories available in the metropole. As in the Portuguese sphere, missionary pharmacies held a considerable share of drug marketing within Spanish global trade networks, though illicit trade carried by foreign interlopers and smugglers played a role in disseminating such medicines, as well (Gänger 2015).

As near monopolists in the global trade of indigenous medicinal substances within the Portuguese mercantile system during the seventeenth and eighteenth centuries, missionary orders relied on this revenue to support their evangelical operations throughout the Portuguese overseas territories (Sousa Dias and Rui Pita 1994, 19–20). Jesuit padres and lay clergy in South America, as elsewhere in the Iberian colonial world, excelled in seeking out and experimenting with indigenous medicinal substances, knowledge which they carefully recorded in manuscript texts which circulated amongst their brethren. Even their secular contemporaries acknowledged the peripatetic, highly trained Jesuits as the unparalleled leaders in indigenous medical prospecting (Santos Filho 1947, vol. II, 26–30).

Most permanent Jesuit colonial missions operated medical facilities—typically an infirmary and a pharmacy—from which they dispensed medical compositions for a profit. Throughout incipient colonial settlements in early modern Brazil, for example, Jesuit mission apothecary shops were common. By the end of the seventeenth century, the Society of Jesus had opened thirteen medical installations in coastal communities and in the interior of the colony. By the mid-eighteenth century, Jesuit medical activities had expanded to include thirty

pharmacies and infirmaries across Brazil (Edler 2006, 33). Most communities of any regional importance had been pioneered by and settled around a Jesuit mission; similar Jesuit hospitals were founded early on in Goa, Mozambique Island and Macau. The resident padres were often the sole resource for learned medical consultations in any given colonial province, and in many enclaves, Jesuit pharmacies were the only source from which to purchase imported drugs or prepared medical remedies (Santos Filho 1947, vol. 1, 112). The Jesuit pharmacy of the College of São Paulo in Macau, for example, became for nearly three centuries the primary, indispensable supplier of drugs to stock shipboard medical chests for every vessel from the West trading in the Pearl River Delta and Canton (Amaro 1992, 7–11).

Contrary to what is often supposed, the Jesuits and other missionary orders were not bound by a strict prohibition on engaging in commerce. On the contrary, canon law stipulated only that ecclesiastics could not purchase objects produced by others with the intent to sell them for profit; they could, however, vend goods that they had made, grown or developed themselves (Alden 1996, 529, esp. note 2). In the case of trade goods like medicines—wares that the missionaries directly gathered and blended, and the profits from which commerce contributed to their evangelical mission—Church and state authorities had no official grounds for objection (though many colonial merchants complained that the Jesuits took advantage of their privileged position to glean large revenues) (Borges 1994, 41, 86). This is precisely why the Jesuits dealt so aggressively and widely in medical drugs (including chocolate); theoretically they were barred from profiting on virtually any other type of trade.²⁰ Indeed, it was precisely because the Jesuits were restricted from trading in conventional commercial goods that they turned to medicines and drugs as a source of revenue. Because healing was a recognized, approved dimension of their missionary activities, and because, by long precedent, infirmaries and dispensing pharmacies had been part of the missionary establishment, evangelical brotherhoods were able to employ their global networks of pharmacies to generate revenue in a way that was perceived to be spiritually legitimate, orthodox and legal.

From this point, the paper will proceed by considering in turn individual manuscripts produced in the Portuguese colonies specifically to convey and disseminate knowledge about indigenous healing substances and medicines. These are fundamental “conduit” documents. Contextual commentary will focus on their provenance, content and significance. In general, the narrative will proceed chronologically.

²⁰In practice, of course, the Jesuits often did engage in various types of commercial activity, often with crown consent, but usually in modest volume. See Alden (1996, 529–531, 540–544); see also Borges (1994, 41, 86).

Anonymous, *Curiosidade; Un Libro de Medicina escrito por los Jesuitas en las Misiones del Paraguay en el Año 1580*

In approximately 1580, Jesuits working in South America compiled a detailed manuscript volume of diverse native remedies found in Paraguay, Chile and Brazil.²¹ The tome is one of the oldest known Jesuit medical handbooks composed from notes made in the mission fields, but it is typical of other handwritten medical field guides that Jesuit missionaries produced wherever they interacted with indigenous peoples.²² A meticulous copy of this manuscript, probably made in the late seventeenth or early eighteenth century by a skilled scribe, resides in the National Library of Rio de Janeiro. Its 280 folios contain an extraordinary amount of ethnographic information about South American healing techniques and pharmacological botany. Most of the work focuses on Brazil; though compiled in no discernable order, it includes an index listing alphabetically more than two hundred medicinal plants discussed in the volume, naming them first in Castilian, and then providing a linguistic concordance with equivalents in the native Tupí and Guaraní languages.²³

The manuscript opens with a thirty-page prologue that explains how to recognize medicinal plants growing in the wild, assess their healing properties and prepare them as curatives through cooking or drying. The prologue describes how best to preserve the prepared medicines to ensure their long-term efficacy, and gives advice about how to successfully administer these remedies. Scores of medicinal plants and roots are explicated, including common Amazonian samples like copaiba and ipecacuanha.²⁴ Interestingly, however, the work displays clear evidence of early cross-cultural medical influences from elsewhere in the empire: in addition to South American *materia medica*, it includes minute instructions for the preparation and administration of plant-based drugs that the Portuguese had imported or transplanted from India and Ceylon, such as nutmeg, pepper, cloves and cinnamon.²⁵

This remarkable tome's very first entry describes the "Virtues of Cacao," or chocolate, made from *Theobroma cacao*, a plant native to the Amazon River headwaters and basin.²⁶ According to the Jesuits' text, prepared chocolate had the

²¹Biblioteca Nacional do Rio de Janeiro (BNRJ), Brazil.

²²See, for example, the BNF, Manuscripts, Fonds Portugais No. 59 (1598), ff. 2–79v; also ARSI, Opp. NN. 17 (1766), pp. 1–494.

²³BNRJ, Manuscripts Division; No. I–15, 02, 026; ink on paper, hard cardboard binding (not original), approximately 14 by 22 centimeters, 280 folios, un-numbered manuscript pages at end of volume. The work is apparently a "fair copy" made by a scribe or Jesuit priest.

²⁴See also Edler (2006, 26).

²⁵BNRJ, Manuscripts Division; No. I–15, 02, 026, ff. 1–7.

²⁶Genetic research has established the origins of all cacao in the headwaters of the Amazon River. See Motamayor, Risterucci, et al. (2002, 380–386).

medical capacity to “open the [body’s] passages [...] comfort the mind, the stomach, and the liver, aid asthmatics [...] and those with cataracts [...]” among other salubrious qualities.²⁷ Through their contacts with native peoples, the Society of Jesus had long known about chocolate as a medicinal substance. Índios in Brazil taught that cacao had medicinal benefits; they recognized chocolate as a mild stimulant that could provide sustaining energy to combat hunger and fatigue.²⁸ This indigenous knowledge provided an added incentive to cultivate cacao trees at Jesuit mission communities in South America.

Jesuit missionaries in fact became the primary producers of cacao in Brazil, cultivating large plantations; the brotherhood monopolized the export and sale of chocolate as a medicinal commodity until the mid-eighteenth century (Walker 2007). The Jesuits also learned how to extract cocoa butter from cacao and sold it as a remedy for skin maladies. By the late eighteenth century, medicinal cocoa butter (*manteiga de cacão*) was being used therapeutically in colonial military hospitals and infirmaries throughout the Portuguese empire. Colonial soldiers and officials in the tropics soothed chafed, dry or abraded skin with cocoa butter; they employed it as a standard regular treatment for heat rashes, or more serious skin disorders like shingles. In Portuguese enclaves in India, missionary pharmacies stocked quantities of Brazilian cocoa butter for daily application to infirmary patients, and for retail distribution to the general population; the *botica* (pharmacy) of the Convent of Santo Agostinho in Goa listed regular monthly purchases of *manteiga de cacão* between 1807 and 1835.²⁹ Cocoa butter from Brazil became a preeminent topical remedy; it could be found in the stocks of colonial pharmacies from Macau to Timor, Mozambique and São Tomé, and in the medical chests of most ships of the Portuguese India fleet, as well, during the late eighteenth and early nineteenth centuries.³⁰

Anonymous, *Breve compendio de varias receitas de medicina* (1596)

Another early effort to expand knowledge within the Portuguese empire about the medicinal uses of indigenous plants is evident in a report compiled in the eastern colonies in 1596 and remanded to Lisbon for the edification of King Filipe II and his ministers, apparently in hopes of stimulating trade in useful medicines from

²⁷BNRJ, Manuscripts Division; No. I–15, 02, 026, *Capítulo* I, 1.

²⁸See previous footnote. See also Clarence-Smith (2002, 10–11); Dillinger et al. (2000); S. D. Coe and M. D. Coe (1996, 121–129, 167–169); Walker (2009b).

²⁹HAG; Manuscripts, vol. 8030.

³⁰AHU, São Tomé and Príncipe Collection; cx. 55, doc. 75.

the Portuguese overseas colonies.³¹ This compendium of medical recipes and the South Asian herbal, animal or mineral substances from which they were made is a lengthy, meticulous account of contemporary healing techniques in India, written by royal order in Goa during the administration of Matias de Albuquerque, Viceroy of the Estado da Índia at the end of the sixteenth century.³² Consistent with the mixed motivations of Portuguese medical knowledge acquisition and transfer, it was also intended specifically to facilitate the dissemination of Indian healing methods to other parts of the Portuguese maritime empire, where they could be applied to safeguard the precarious health of colonial troops and functionaries in the tropics. This report was most likely composed by a Jesuit attached to the Hospital Militar de Goa, the main colonial health facility, which operated under Jesuit administration after 1579 (Alden 1996, 338).

However, this document was destined for broader distribution within the Portuguese sphere and beyond. A copy of the compendium, made by a Jesuit missionary priest a century after its initial composition, is now found in the Bibliothèque Nationale de France.³³ Flemish Padre François de Rougemont, awaiting his departure in Lisbon for Macau in the mid-seventeenth century, apparently copied the richly informative document for his personal use in the mission fields of China (he arrived to Macau in 1658).³⁴ Most of the text is composed of remedies and treatments for specified named conditions, symptoms or maladies. Thus, the compendium has a diagnostic purpose for tropical illnesses, as well as a didactic objective regarding medical plants, minerals and herbs. The latter half of Padre Rougemont's 155-folio bound manuscript includes notes, apparently added in the mission fields, about supplementary Chinese remedies and entries of medical information to augment his original text, including Chinese, Dutch and French language passages.³⁵ The tome shows signs of frequent use, apparently having been consulted to heal the sick in the Far East before being returned to the French national library in the late nineteenth century. So, in this remarkable text we see a late seventeenth-century French-speaking Flemish Jesuit copying a late sixteenth-century Portuguese text about Indian medicine for use in China until at least the late eighteenth century, moving medical information about South Asia to East Asia and back to France.

³¹Bibliothèque nationale de France, Département des Manuscrits, Fonds Portugais No. 59, *Esperiencias das hervas orientaes que Sua Magestade mandou fazer ao vizorey Mathias de Albuquerque, anno de 1596*, ff. 29–77v.

³²See previous footnote.

³³Bibliothèque Nationale de France, Département des Manuscrits, Fonds Portugais No. 59, *Breve compendio de varias receitas de medicina*, ff. 2–79v.

³⁴I am grateful to Oana Baboi of the University of Toronto for this reference.

³⁵*Ibid.*, ff. 79–155 (Chinese text on ff. 151v–152; French text on ff. 124–127v).

Clearly, in 1596 there was an obvious additional commercial motivation for creating this comprehensive list of eastern medicinal recipes. Portuguese merchant interests (and the Spanish monarchy then ensconced on the Portuguese throne) hoped to profit from such remedies by selling them in metropolitan Iberian markets and colonial regions in Africa and the Americas, but also to rival colonial powers in Europe. At that time, Portuguese colonial interests held a virtual monopoly on both the sources for medically efficacious Asian plants and much of the knowledge about how to apply them. Portuguese spice and drug merchants (ecclesiastical and secular) thus positioned themselves deliberately to operate as the global conduit for Asian medical information, expressed in European medical terms and in a European language.

Manuel Godinho de Erédia, *Suma de Árvores e Plantas da Índia Intra Ganges* (Goa 1612)

Another early colonial Portuguese attempt to create a compendium of medicinal plants from South Asia was that of Manuel Godinho de Erédia (1558?–1623),³⁶ a Malay-Portuguese military draftsman, cartographer, and adventurer who developed an interest in botany while travelling in the Estado da Índia. His extraordinary work, a herbal entitled *Summary of the Trees and Plants of India beyond the Ganges*, was compiled in Goa in 1612 but never published until modern times (Erédia 2001). The manuscript, which has resided in the Abby de Tongerlo in Belgium since the mid-eighteenth century, contains seventy-four folio-sized illustrations of Indian plants, the majority of them having medicinal uses described overleaf in the author's accompanying notations. Richly colored and finely drawn (the images are far superior to the woodcuts used in Cristovão da Costa's text of 1578), Erédia's manuscript was intended to provide Europeans—specifically the colonial elites who were his patrons—with an accurate idea of the appearance and application of what, in Erédia's experience, were the most frequently employed and useful South Asian healing plants. While employed in the service of the Portuguese crown to record military installations in Asia, Erédia's work may have been intended primarily to help colonial officials preserve the lives of garrison soldiers in tropical imperial strongholds.³⁷ However, the manuscript could have served equally well as a tool for merchants hoping to identify Asian medical commodities for shipment (Erédia 2001, 9–26).

Erédia's status as a mixed-race agent of the Portuguese empire (born of a Luso-Spanish father and Malaysian mother; he grew up in Malacca) perhaps made

³⁶Manuscript held in the Abby de Tongerlo, Belgium.

³⁷Manuel Godinho de Erédia, *Lyvvo de Plantaformas das Fortalezas da Índia* (circa 1622–1640) (manuscript; Oeiras, Portugal: Biblioteca do forte de São Julião da Barra; Ministério da Defesa Nacional).

him more aware of the cultural context and procedural subtleties of the *materia medica* which he compiled; the quality of his botanical images were unmatched until the publication of the Dutch botanist Hendrik van Reede's twelve-volume *Hortus Malabaricus*, compiled in Cochin between 1678 and 1693. Although the impact of Erédia's text was severely limited by its not having been reprinted or widely circulated (instead it fell into obscurity), the work must have been edifying to those who kept it safe for over a century before depositing it in a monastery in Flanders (Erédia 2001, 9–26).

In her contribution Florike Egmond (2013) also analyzes the didactic illustrations that Manuel Godinho de Erédia created, noting that his expertise as a naturalist was far superior to that of a casual observer. Egmond argues that Godinho may have “intended his album to be printed as a kind of handbook for apothecaries” because he carefully recorded specific Asian plants used in native remedies, including commentary on the circumstances of their proper application. He also offered his informed observations about the migrations and importation of various plants into India. With good reason, Egmond speculates that Godinho's meticulous methodology may be attributed to the time he spent studying with Jesuit mentors in Goa, but she also notes that he appears to have drawn some of his information from Garcia da Orta's earlier work. It may be the case, though, that Godinho, as a native raised in Asian trade ports and familiar with such regional healing techniques, serves to independently confirm methods that Orta had first reported half a century before.

Moving into the Eighteenth Century: Increasingly Systematic and Comprehensive Efforts

Anonymous, Coleção de Varias Receitas e Segredos Particulares das Principais Boticas da Nossa Companhia de Portugal, da India, de Macao e do Brazil (1766)

One exceptional document held in the Archivum Romanum Societatis Iesu (Society of Jesus Archive, Rome)³⁸ provides unparalleled insights into the elevated and genuinely global level of circulation of medical information achieved by the Jesuit Brotherhood. In 1766, a few years after the Jesuit Order was expelled by royal decree from all Portuguese territories (1759–1760), a scholarly Jesuit apothecary in Rome compiled this work, one of the most remarkable medical documents of the Enlightenment era. This document is a compendium of medicinal recipes taken from all principal Jesuit mission pharmacies from across the Portuguese empire, deliberately recorded for posterity in the mid-eighteenth century. Stated

³⁸Manuscript held at the ARSI, Opp. NN. 17, 1–494.

unequivocally in the volume introduction is the caveat that such valuable medical knowledge should be codified and preserved, but not shared outside the Jesuit order, in order to safeguard future profits to be gained from such rare pharmacological knowledge (Coleção de Varias Receitas: 2–3).

For purposes of understanding the scale of dissemination of medical knowledge throughout the Portuguese colonial world, this tome is a keystone document. Its title (in English) is: *A Collection of Various Recipes and Particular Secrets of the Principal Apothecaries of Our [Jesuit] Company in Portugal, India, Macau and Brazil*. The bound manuscript is 688 octavo pages in length and contains over 300 detailed medical recipes (ingredients; proportions; mixing instructions; applications), nearly all employing a mélange of indigenous healing plants borrowed from native traditions throughout the Portuguese imperial system. The document has never been published or systematically transcribed; only a few brief excerpts of it have been published in facsimile, though the entire volume was recently digitized. A careful transcription of the full contents of this document does exist, however, made by mid-twentieth-century Luso-Brazilian Jesuit researcher Serafim Leite, S. J. (1953, 284–293).³⁹

This unique Jesuit medical compilation held in their Rome archives offers a singular overview of Jesuit medicinal recipes employing diverse, blended indigenous healing knowledge collected from across the Portuguese colonial world. Thus, this unparalleled manuscript is a unifying document, representing and demonstrating in a single work the extent of globalization and cross-cultural hybridization achieved in Portuguese imperial medical practices.

But the learned priests of the Society of Jesus were not the only ones to see the potential utility of a comprehensive program to gather and codify global medical information. Toward the end of the eighteenth century, spurred perhaps by a growing awareness of systematic Enlightenment-era approaches to knowledge (Simões, Carneiro, and Diogo 1999; Caneiro, Simões, and Diogo 2000), the Portuguese monarchy and colonial administrators in Lisbon also began to take an increasingly active interest in seeking useful medicinal plants from their colonies in South America and Asia. Sustained heavy losses of human capital in the tropical colonies—not only among European soldiers, administrators, and settlers, but also among valuable enslaved persons shipped as merchandise across the Atlantic and Indian Oceans—seems to have prompted this renewed initiative. Typically during the sixteenth to eighteenth centuries, new European or African slave arrivals to the Portuguese colonies suffered terribly high rates of mortality, their ranks shrinking rapidly during the first year of relocation due to brutal work, harsh acclimatization and tropical diseases. Until the early nineteenth century, annual

³⁹Dr. Amy Buono of Southern Methodist University is currently preparing a critical edition of this work in English translation at the Max Planck Institute for the History of Science, Berlin.

mortality rates of 25% to 50% were common for newly disembarked European soldiers and African slaves in Portuguese colonial enclaves.⁴⁰ The Conselho Ultramarino (Myrup 2006, 61–73), desperate to find effective remedies that could reduce casualties, commissioned medical authorities in Brazil, India and Africa to write descriptions of all the medicinal native plants and roots in their respective areas.⁴¹ Until Brazilian independence in 1822, crown authorities in Lisbon maintained their interest in discovering new South American indigenous remedies that could be of therapeutic—and commercial—use in imperial endeavors.

Francisco Arsenio de Sampaio, *História dos Reinos Vegetal, Animal e Mineral* (manuscript compiled at Cachoeira, Bahia, Brazil, 1782 [volume I] and 1789 [volume II])

*History of the Vegetable, Animal and Mineral Kingdoms, pertaining to Medicine*⁴² was a particularly ambitious project of pharmacological botany undertaken by Francisco Arsenio de Sampaio, a Portuguese-born physician resident in Bahia, Brazil in the late eighteenth-century. Sampaio compiled the multi-volume work between 1782 and 1789 at Cachoeira, the main agricultural market town on the Paraguaçu River in the fertile Bahian hinterland around the Bay of All Saints. Sampaio was an Enlightenment-era médico who clearly wanted to expose his countrymen to a deeper knowledge and understanding of the traditional indigenous medicinal plants with which he regularly worked. Indeed, the project, due to of its structure and scope, shows telltale signs of having been produced by commission, possibly at the behest of colonial authorities in Bahia or Lisbon. Two extant manuscript tomes each contain highly detailed descriptions of a variety of native South American plants, a summary of their healing virtues, proper doses to administer to patients, and methods for applying each remedy to the sick.

⁴⁰For transatlantic slave trade mortality rates, see Eltis (1999, 68, 159, 185–186). For figures of the annual number of patients treated at the *Hospital Militar* in Goa at the end of the eighteenth century, see HAG MR 173, f. 168 (3476 patients in 1791); HAG MR 176B, f. 436 (3858 patients in 1793); HAG MR 176B, f. 448 (3076 patients in 1794); and HAG MR 177A, f. 218 (1932 patients in 1797).

⁴¹For India, see Ignácio Caetano Afonso, *Discipçoens e Virtudes das Raizes Medicinaes* (“Descriptions and Virtues of Medicinal Roots”), manuscript booklet (1794), HAG MR 175, ff. 219–230; see also references to a similar royal directive, dated 2 April 1798, in HAG Monções do Reino 178B (1798–1799), ff. 644–645. Also for India, see BACL, Mss. 21 (Série Azul): *Medicina Oriental: Socorro Indico, Aos Clamores dos Pobres Enfermos do Oriente; Para total profligação de seus males adquiridaa da varios Profassores de Medicina* (anonymous; no date [eighteenth century?]) 1–632. For Brazil, see Bento Bandeira de Mello, manuscript (1788); ANTT, Ministério do Reino, cx. 555, mç. 444. For Angola, see Pinto de Azeredo (1799).

⁴²Manuscript held at the Biblioteca Nacional do Rio de Janeiro, Brazil.

Although the painstaking work was obviously intended for publication to a broad readership in the transatlantic medical and scientific community, for unknown reasons the project never went beyond the manuscript stage. Sampaio's work may have been considered too provincial, or he may have been unable to win the support of an influential patron in the metropole.⁴³ Fair copies of the first two volumes, handwritten and bound together with stunning original painted illustrations of Brazil's flora and fauna, are deposited in the Biblioteca Nacional in Rio de Janeiro. The plants described in Sampaio's first volume are organized into twelve sections according to their contemporary medicinal applications. Groups of plants evincing astringent, anti-venom, anti-colic, anti-spasmodic, purgative and anti-venereal healing qualities are each treated in their own discrete chapters.

Francisco Arsenio de Sampaio had been born at Vila Real in northern Portugal, but immigrated to Brazil as a young man. Where he completed his medical studies is not clear (most likely in Portugal, possibly as an apprentice at the Todos-os-Santos Hospital in Lisbon), but he was an approved surgeon with a license to practice medicine granted by the Bahian colonial senate (Arsenio de Sampaio, vol. 1, f. 1). He held the post of surgeon at the Hospital of São João de Deus in Cachoeira for nearly two decades. Volume I of his work, completed in 1782, described medicinal plants in 219 manuscript pages, supported by another twenty pages of color miniature paintings that skillfully rendered many of the plants described in the text. Sampaio included an alphabetical index of each plant name (noting their indigenous Tupí and Guaraní names, as well), and commented on non-native medicinal plants, like coffee, pepper and cinnamon, that the Portuguese had introduced from their overseas territories (Arsenio de Sampaio, vol. 1, 1, 117–124). Had the work been published, it would have contributed greatly to knowledge of regional Brazilian healing plants in the Lusophone world. Circulation of Sampaio's manuscript was probably minimal; therefore its ultimate impact as a conduit of information, though uncertain, was likely very meager.⁴⁴

Bento Bandeira de Mello, untitled memorandum about medicinal plants of Brazil (1788)

Elsewhere in Portuguese America, at about the same time, a similar state-directed effort to gather medicinal knowledge was underway—this one explicitly

⁴³The Portuguese crown permitted no printing press in Brazil until 1808, when the royal court and family took up residence in Rio de Janeiro; until then, all printing projects had to be sent to Lisbon for approval and typesetting, Skidmore (1999, 32–40).

⁴⁴Both volumes of Francisco Arsenio de Sampaio's *História dos Reinos Vegetal, Animal e Mineral, Pertencente à Medicina* were eventually published together as a special issue of the journal *Anais da Biblioteca Nacional*, vol. 89 (Rio de Janeiro, 1969). I am grateful to Fabiano Bracht of the University of Porto, Portugal, for alerting me to this reference.

state-directed. In 1788, Brazilian physician and natural scientist Bento Bandeira de Mello submitted a lengthy memorandum on frequently used indigenous medicines in his region, the coastal northeast of Brazil.⁴⁵ De Mello was responding to a direct royal order from Queen Maria, transmitted through the Overseas Council; he had been charged with creating an alphabetical list of medicinal plants, fruits and roots from the territories of Pernambuco and Paraíba, with commentary concerning their curative effects. His annotated roster, containing fifty-nine different South American medicinal plants, runs to twenty-four manuscript folios.

Examples of native healing plants de Mello discussed in his compilation include various types of ipecacuanha (also called cipó), a reliable emetic and diaphoretic; cinchona bark (also called quina or quineira), arguably the most important remedy found in the New World, a febrifuge essential to treating malaria and other tropical fevers (Jarcho 1993, 102–104, 297–298; Maehle 1999, 223–233); jalapa, an effective purgative; copaiba, to treat gonorrhea; and salsaparilha, administered against syphilis and skin diseases.⁴⁶ More than any others, these particular Brazilian remedies traveled within the Atlantic medicinal economy, gaining widespread medical usage elsewhere in the Portuguese empire, and becoming both medically and commercially significant commodities.

Per royal instructions, de Mello sent specimens of many of these plants to the Ajuda Palace royal botanical garden in Lisbon, where they were assessed for their medical usefulness, and suitability for transplant to other imperial regions.⁴⁷ Hence, the impact of his work carried farther than the palace chambers of the Conselho Ultramarino. The desired end of this official initiative, of course, was to further Portuguese aims by reducing chronic, unacceptably high wastage of human resources through injury and illness. As the following documents illustrate, this policy to consolidate strategically useful medical knowledge extended to contemporary Portuguese colonies in India, as well.

Ignácio Caetano Afonso, *Discripçoens e Virtudes das Raizes Medicinaes* (1794)

During the closing decades of the eighteenth century, as a result of limited human resources, imperial exigencies and generations of cultural blending, even the chief physician of the Estado da Índia was a native Goan: Ignácio Caetano Afonso, born

⁴⁵Manuscript held at the Arquivo Nacional de Torre do Tombo, Ministério do Reino. cx. 555. mç. 444; Lisbon, Portugal.

⁴⁶Vicente Jorge Dias Cabral (1801), “Ensaio Botânico de algumas plantas de parte interior do Piauí [...]” AHU (AHU-ACL-CU-016, cx. 25, D. 1311) (1801); Sousa Pinto (1837, 21, 31); Mendes Ferrão (2005, 157–160).

⁴⁷ANTT, Ministério do Reino, cx. 555, mç. 444., f. 2.

into an elite Portuguese-speaking Indo-European family. Though he had access to little formal medical training in the European sense, he gained a very favorable reputation as a healer. In March 1798, in a letter to the Portuguese Secretary of State in Lisbon, the Governor of the Estado da Índia, Dom Rodrigo de Souza Coutinho, described Afonso as “a Brahmin [...] favored with natural talents” for healing. The Governor continued, saying that “notable cures” had been attributed to him, even though he “had not opened any [medical] book for many years.”⁴⁸ The following year, after Afonso’s death, Governor Souza Coutinho would write that Afonso had “the sense of a Médico, and practiced for many years, which compensated for the defects of his [medical] education.”⁴⁹

While Afonso appears to have studied informally in Goa at the Hospital Militar under his predecessor, the Portuguese-born, Coimbra University-trained physician Luís da Costa Portugal (who had made a practice of taking in promising Goan healers and training them in Western medical techniques),⁵⁰ Afonso’s medical knowledge consisted primarily of native Indian plants and their medicinal applications. In the main, Afonso treated Portuguese soldiers, officials and colonists with local remedies derived from indigenous Indian drugs—medicines that Afonso learned from older Goan healers, who had employed them since time immemorial. Ignácio Caetano Afonso was a product of this rich blended healing culture.

In 1794, the Conselho Ultramarino called upon Ignácio Caetano Afonso to report on efficacious medicinal plants available in Goa. In response, the Indo-Portuguese chief physician sent colonial authorities in Lisbon a twelve-page manuscript summary,⁵¹ which he titled “Descriptions and Virtues of Medicinal Roots.”⁵² The document named five of the most widely used medicinal roots or plants in Goa, described their appearance, methods of gathering them, and their proper preparation and application. One example of the several medicinal roots to which Afonso referred was the celebrated pau cobra, or “cobra wood,” a name applied to several varieties of plant root known across south India and thought to be effective against snakebite or other venomous animal stings. According to Afonso’s manuscript report, pau cobra was known in Ceylon, the plant’s native home, as “Hampaddu Tanah”—Afonso rendered the name phonetically in his Portuguese-language text (Dalgado 1988, vol. 2, 196–197). In Goa, Afonso

⁴⁸HAG MR 177A, f. 212. Letter dated 14 March 1798.

⁴⁹HAG MR 178A, f. 272. Letter dated 28 April 1799.

⁵⁰HAG MR 177A, f. 212.

⁵¹Manuscript booklet held at the Historical Archive of Goa, India.

⁵²Ignácio Caetano Afonso, *Discricpoens e Virtudes das Raizes Medicinaes*, manuscript booklet (1794), HAG MR 175, ff. 219–230, see also references to a similar royal directive, dated 2 April 1798, in HAG Monções do Reino 178B (1798–1799), ff. 644–645.

wrote that the plant was well known among indigenous “herbalists,” but that it was generally referred to by its Portuguese name.⁵³

Ongoing concerns about the health of soldiers and colonial officials in the tropics prompted imperial authorities in Lisbon to continue their efforts to discover new indigenous remedies from India or elsewhere that could be of use in supporting crown endeavors. In a royal directive dated 2 April 1798, the new *Cirurgião-Môr* (chief surgeon) and other *medicos* of the Hospital Militar de Goa were once again given an opportunity to display their knowledge of indigenous medicine from Portuguese India. Queen Maria I, and the *Conselho Ultramarino*, seeking medicines to treat tropical diseases throughout the Portuguese maritime colonial network, commissioned the Goa Hospital Militar staff physicians and surgeons to write a description of all the useful medicinal plants found along the Malabar Coast and in the remaining Portuguese enclaves in India.

The following year, *Cirurgião-Môr* Dr. José Abriz and his colleagues produced a report, extending to nearly forty manuscript pages, in which they provided thorough descriptions of eleven important roots and plants then in use in the medical facilities of Goa, Damão and Diu, as well as the east African colonial holdings.⁵⁴ Following the order in which they appear in the text, these plants are: *Raiz de Cobra* (“snake root”), for venomous serpent, insect and animal bites; *Calumba*; *Butua* (also known as *Pereira Brava*), used to treat wounds and bites; *João Lopes Pinheiro*, a febrifuge and carminative; *Pedra Quadrada*, a mineral used as an astringent and to ward off illness; *Casca de Raiz de Intaca*, a root administered for colds and fevers that come from fatigue, or “venereal excesses”; *Bangue*, a calming preparation made from *cannabis sativa*; *Cuia Cuia*, for dysentery; *Batatinha*, a febrifuge; *Contos do Espinhos*, worn to ward off seasonal monsoon fevers; and *Inhofancos*, a diuretic, febrifuge, and antispasmodic.⁵⁵

The medical professionals in Goa included their report with the official correspondence of the *Estado da Índia* (the *Livros dos Monções do Reino*), sent to Lisbon aboard the annual government-sponsored vessel; their cover letter is dated 29 April 1799.⁵⁶ In this way, reports about tropical medical substances thought to be efficacious were circulated through official colonial administrative correspondence and made available to crown authorities at the highest levels in the home country.

⁵³HAG MR 175, ff. 220r–221v.

⁵⁴HAG *Monções do Reino* 178B (1798–1799), ff. 644–664.

⁵⁵See previous footnote.

⁵⁶HAG *Monções do Reino* 178B (1798–1799), f. 644.

Anonymous, *Medicina Oriental: Socorro Indico, Aos Clamores dos Pobres Enfermos do Oriente; Para total profligação de seus males adquiridaa da varios Professores de Medicina*

Yet another extraordinary botanical cataloguing project undertaken specifically to facilitate the transfer of medical knowledge within the Portuguese colonial system is a work entitled *Oriental Medicine: Indic Assistance, for the Clamors of those Poor Infirm Patients of the Orient; For total alleviation of its ills, Acquired from various Professors of Medicine*.⁵⁷ This work is an anonymous, undated manuscript of 1312 pages, apparently compiled in India during the second half of the eighteenth century; on the title page, the author reveals only that he is a native-born Goan. Like Garcia da Orta's work of 1563, it was intended manifestly as both a didactic and commercial medicinal guide—though this second purpose remains unstated.⁵⁸

In a highly telling circumstance, once conveyed to Europe, the manuscript was deposited in the library of the Lisbon Royal Academy of Sciences, which was founded by Queen Maria I in 1779 as an Enlightenment-era institution to facilitate the establishment of empirical learning in Portugal. The work's first 632 pages describe a total of 781 different medicinal substances (derived from “plants, fish, birds, animals, minerals and precious stones”) from India and other colonized regions of Asia. The unknown author provided information in minute detail about these plants' healing qualities, applications, and names in Indian and European languages (*Medicina Oriental*, 1: frontispiece).

Though the precise provenance of this work is unclear, its dedication (to “The Most Holy Trinity of the One True God”), exceptional intellectual rigor and detail suggest that it was composed by a professional medical practitioner of long experience in the Portuguese colonial hospitals or infirmaries of Asia. It is possible, even likely, that the author was a Jesuit priest, but the tome may have been composed by a learned Indo-Portuguese physician employed in one of the missionary medical facilities in Goa. Nor is it certain that the work was commissioned directly by royal or imperial authorities—though that it was incorporated early on into the Royal Academy of Sciences library provides a hint of its perceived importance at the time, and possibly its patronage.

The volume has not been meticulously assessed by modern historians of medicine, but it promises to provide future researchers with a rich trove of insights into contemporary Portuguese understanding of South Asian *materia med-*

⁵⁷ Manuscript held in the Biblioteca da Academia das Ciências de Lisboa.

⁵⁸ Anonymous, *Medicina Oriental: Socorro Indico, Aos Clamores dos Pobres Enfermos do Oriente; Para total profligação de seus males adquiridaa da varios Professores de Medicina*; Biblioteca da Academia das Ciências de Lisboa (BACL), Mss. 21 (Série Azul); no date [second half of the eighteenth century?], 1–632.

ica. Like the prodigious contemporary work concerning remedies from Brazil by Francisco Arsenio de Sampaio, this project seems to have been intended for publication as a comprehensive compilation of all known medical lore for the region it covers (coastal southern and western India).

Friar Leandro de Madre de Deus, *Notícias Particular do Comércio da Índia* (dated 13 July 1772 at the Court of Pune)

Portuguese missionaries, physicians and diplomats in India also played a role in distributing European and Malabar Coast remedies to the Muslim Mughal court in the northern interior of India. Whenever the Portuguese sent an envoy to negotiate with the reigning Raja in Agra, for example, custom dictated that gifts be exchanged. Among the perfumed herbs, rich fabrics, silver inlaid blades and potent distilled beverages (notably aguardente and cashew feni) sent as tribute, the Portuguese commonly sent typical Hindu-influenced medicines, such as balsamo apopletrico, for headaches, and sandalwood paste for fevers. One typical example of this practice can be found in a record of the Portuguese embassy to the court of Raja “Sauac Bacinga” (rendered phonetically in Portuguese) in December 1737; the itemized presents filled dozens of medicinal jars, bottles and ornate chests.⁵⁹ Occasionally Mughal authorities would request the services of a European physician from Goa to treat a malady that proved unresponsive to the methods of court healers Manucci 1907, vol. 2, 157–167). Such treatments commonly consisted of a mixture of European and indigenous medicines drawn from across the empire.

The courts of the Indian rulers were also good vantage points from which to observe the general movement of commercial goods within the maritime world of the Far East. Up-to-date information about that system of trade was of course a commodity to be valued of itself, and the Portuguese governors in Goa were eager to gather, disseminate and exploit intelligence on this matter for the benefit of their own commercial interests, as well as those of the merchants of the Estado da Índia. In about 1770, a Capuchin priest named Friar Leandro de Madre de Deus was attached to the court at Pune as a missionary and healer, but he was also a confidant and correspondent of the Governor General of Portuguese India, Dom João José de Melo. Friar Leandro’s official instructions charged him with helping a Portuguese physician who had been dispatched from Goa to attempt to heal the ailing potentate at Pune, Madó Rao, but the Capuchin priest was also gathering information about the hostilities developing at that time between the Portuguese and the rulers of Maharashtra.⁶⁰ Two years later, Friar Leandro produced a comprehensive description of the trade routes, commodities exchanged

⁵⁹HAG 1429, *Regimentos e Instruções* (1727–1737), f. 229.

⁶⁰HAG 1436, *Regimentos e Instruções* (1771–1774), f. 11r/v.

and prices obtained for goods throughout the principal ports of the Far East, from the Indian Ocean to Macau, and sent it to the ruling council of the Estado da Índia in Goa.⁶¹ Friar Leandro's Particular Notices of the Commerce of India is a comprehensive overview of this complex, geographically broad trade network, one of the first guides of its kind, showing how goods purchased in one location could be sold for a profit in another as merchant ships discharged and loaded goods when sailing from port to port.⁶²

Leandro included numerous medicinal plants, drugs and spices used in curative preparations in his description of trade goods sent out from India, of course; the merchants of the Portuguese colonies sold these Malabar Coast remedies in various ports in China, Annam (Viet Nam) and the East Indies. Most are classical Indian medicinal substances that had long-accepted uses in traditional Ayurvedic healing, as well as in the local cultures along the southwest coast of India.⁶³ *Notícias Particular do Comércio da Índia* describes Indian sandalwood, stag horn and clove oil from Ceylon bringing high profits in Macau when sold as remedies.⁶⁴ The gum resin myrrh, purchased in Calicut or Cochin, could be sold for substantial gains as a medicinal ingredient in Malacca or Macau.⁶⁵ The balsam or salve made from benzoin, purchased in eastern India, had a profitable market "in every part of the world," according to Leandro's report.⁶⁶ Tamarind and pepper, also sold throughout Asia as medicinal substances, left India in the holds of Portuguese merchant vessels. All of these medicinal commodities, of course, have their place in the classical Ayurvedic tradition; Friar Leandro's text implicitly acknowledges that these medicines were to be applied essentially as longstanding Ayurvedic practice recommended.

Notícias Particular, then, provides a contemporary late eighteenth-century description of Portuguese commercial distribution methods of Indian healing substances, but it is itself also a conduit of practical, professional medical information about those drugs. This report was probably copied and disseminated, like others similar to it, among merchants and officials of the Estado da Índia, and most likely used to inform the Conselho Ultramarino in Lisbon, as well.⁶⁷

⁶¹ Held at the Central Library of Panaji, Goa.

⁶² Central Library of Panaji, Goa; Manuscripts No. 18: *Notícias Particular do Comércio da Índia* (dated 13 July 1772 at the Court of Pune, by Friar Leandro), ff. 2–58.

⁶³ *Ibid.*, ff. 27–36.

⁶⁴ *Ibid.*, f. 28.

⁶⁵ *Ibid.*, f. 27.

⁶⁶ *Ibid.*, f. 32.

⁶⁷ A similar document describing commercial transfers of medical substances, dated 1779, is held in the Arquivo Histórico Ultramarino in Lisbon, and has been published in Afzal (1997, 51–118).

Conclusion

European epistemologies of medicine evolved during the early modern period in no small part as a result of the Portuguese colonial experience. The presence of diverse Portuguese agents in disparate colonial spaces across several continents occasioned the transfer and diffusion of medical knowledge to Europe and throughout their entire imperial network, where no direct lines of contact had existed prior to the establishment of maritime commercial and administrative links. Indigenous peoples of the Portuguese colonies thus made important contributions to “Western medicine” during the early modern period, but did so through European intermediaries, who often altered the original application of native medicines (or the philosophy behind indigenous healing techniques) to meet their own ends. This transfer of healing information, because it was accomplished mainly by Europeans using tools of transmission peculiar to them (written reports, guides, and letters), depended ultimately on European interpretations, ideas, and concepts about medicine. Thus, medical descriptions of newfound drugs and their effects were usually couched in contemporary Galenic or humoral terms. But a commercial focus on portable, saleable medical commodities helped to inspire a changing approach to illness, with a gradually increasing focus on the idea of medical “specifics”—single remedies intended to address discrete maladies.

Portuguese colonial agents (missionaries, merchants, military officers, medical practitioners, colonial administrators) displayed widely varying motives for gathering and disseminating indigenous knowledge about healing. Thus, their different approaches to, and methods of, knowledge transmission affected the ultimate impact of the bodies of knowledge that they diffused. Commercial agents saw native medicines mainly as a profitable commodity, to be marketed and sold in distant regions where the exoticism of a product might increase demand, and consequently price. Missionaries viewed mastery of local medicine as tool of evangelizing and conversions, though they, too, came to rely on the revenue that sales of medicines could generate. Colonial medical officials seem to have been motivated by a genuine professional ethic—the desire to spread efficacious healing techniques for the edification of their colleagues in the metropole. Crown authorities, meanwhile, were moved by strategic imperial exigencies to view the command of medical resources as a means to protect meager, fragile human resources. Taken together, these protracted efforts represent an unparalleled framework for medical knowledge acquisition and dissemination: during the early modern period, Portuguese colonial agents brought indigenous drugs and information about native healing methods back to Europe, and spread such commodities and techniques to colonial Lusophone territories around the globe.

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Abbreviations

AHU	Arquivo Histórico Ultramarino (Portuguese Overseas Historical Archive); Lisbon, Portugal
AHSTP	Arquivo Histórico do São Tomé e Príncipe (National Archives of São Tomé e Príncipe)
ANTT	Arquivo Nacional da Torre do Tombo (National Archives of Portugal)
ARSI	Archivum Romanum Societatis Iesu (Society of Jesus Archive, Rome)
BACL	Biblioteca da Academia das Ciências de Lisboa (Academy of Sciences, Lisbon)
BMJB	Biblioteca do Museu do Jardim Botânico (Library of the Museum of the Botanical Garden); Lisbon, Portugal
BNF	Bibliothèque Nationale de France; Paris
BNRJ	Biblioteca Nacional do Rio de Janeiro (National Library; Brazil)
CLPG	Central Library of Panaji, Goa, India
HAG	Historical Archive of Goa, India
MR	Livros dos Monções do Reino (annual volumes of official state correspondence from and to the Estado da Índia)
cx	caixa (box)
ff	folhos (folios)
mç	maço (bundle)

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Chapter 7

Women's Medicine in the *Cuatro Libros de la Naturaleza* of Francisco Ximénez (1615): Interchanges and Displacements

Angélica Morales Sarabia

In the late eighteenth and early nineteenth centuries, Mexican physicians, naturalists and pharmacists regarded Francisco Hernández (1517?–1587) as one of the preferred sources, when it came to the study of indigenous *materia medica* and botany. There were two key texts from the corpus of Hernández. The first is the *Cuatro libros de la naturaleza* done in New Spain by Francisco Ximénez (1615); this work is based on a copy of a selection from the Latin text of Hernández prepared by Antonio Nardo Recchi, of which the Accademia dei Lincei in Rome produced a different edition in the *Rerum medicarum Novae Hispaniae* (1651). The second is the edition of three of the five volumes of Hernández' *Historia natural de la Nueva España* which Casimiro Gómez Ortega managed to prepare in 1790, thanks to the discovery of the original version in the Colegio Imperial by Juan Bautista Muñoz at the end of the eighteenth century (Álvarez Peláez and Fernández González 1998, 44). The latter is known as the “Madrid edition” to distinguish it from the “Rome edition.” Other texts consulted at the time, which referred to or incorporated material from Hernández, were *Verdadera medicina, cirugia y astrologia* (1607) by Ioan de Barrios, and *Problemas y secretos maravillosos de las Indias* (1591) by Juan de Cárdenas (2003 [1591], facsimile).

The preponderant place of Hernández in natural science and medicine was due to the wealth of information on medicinal plants described in his work, which it should be noted, was not superseded by any other scientific enterprise until the Real Expedición Botánica to New Spain (1787–1803) by Martin Sessé (1751–1808) and José Mariano Mociño's (1757–1820),¹ moreover, it had an almost immediate impact on the global botanical classification.² Other texts circulated that

¹Francisco Hernández managed to collect information on more than 3,000 plants, 500 animals and 35 minerals, besides numerous drawings and information about each of the exemplars he collected, Maldonado and Puig-Samper (2001, 38).

²The aim of this expedition was to save some of the materials of Francisco Hernández that had remained in New Spain, as well as to compile an inventory of the flora of New Spain. The precise number of plants collected is not known, although the impact was almost immediate and was reflected in various herbals, plant collections, drawings and descriptions by the members of the expedition. This

did not go into print until the nineteenth or twentieth centuries and whose influence therefore was less or came later than that of Hernández. The latter includes Fray Bernardino de Sahagún's *Historia general de las cosas de Nueva España*, one of the major sources on native, especially Náhuatl, medicine; and the *Libellus de Medicinalibus Indorum Herbis* by Martín de la Cruz that, although compiled in 1552, was not printed until 1932.³

The Hernandine corpus was the basis for the research agenda on *materia medica* of the Museo Nacional, the Escuela Nacional de Medicina and the Instituto Médico Nacional, to mention only a few of the late nineteenth-century scientific institutions of Mexico. They augmented the information collected by Hernández on purgatives, anti-malarial plants, astringents, soporific or anodyne plants and others. The nineteenth-century scientists established a continuum between the past and the present that enabled them to “restore” that inexorably lost past. The gains were double: they obtained legitimacy in the process of constructing their scientific genealogy; and they continued to apply an experimental empiricism to the study of medicinal plants.

The present contribution focuses on the medicinal plants listed in the *Cuatro libros de la naturaleza* that were used in particular to treat women's ailments. Unlike other texts on medicine or *materia medica* that were printed in New Spain in the second half of the sixteenth and the first half of the seventeenth century, Ximénez's translation provides invaluable information on women's ailments and the measures adopted to treat them. Moreover, it is possible to detect a residue of a wider culture concerning the body, pain and beauty of women in New Spain. Though the argument would exceed the bounds of the present contribution, my hypothesis is that the therapeutic arsenal deployed to deal with women's medical problems registered in the Hernandine corpus in the sixteenth century decreased in the publications on *materia medica* of the following centuries, except for certain plants that managed to transcend time and medical paradigms such as *cihuapatli* (tree daisy), which continued to be used for centuries by physicians and midwives, to induce uterine contractions.⁴

was an obstacle to the proper publication of its results as a whole. Nevertheless, in one of the most important studies of the iconographic collections of this expedition, McVaugh gives a total of 7,500 names of plants connected with the expedition. Fernández de Celaya, Paloma Blanco, “Los resultados botánicos: manuscritos y herbarios” Maldonado and Puig-Samper (2001, 55).

³The works of Hernández, Sahagún and de la Cruz cover a total of 4,051 plants, only 1,647 of which are botanically recognized today. It should be noted, however, that the total number of plants may vary as these figures do not take into account botanical species and there are many repetitions among the three authors, Castillo, Quijano, and Reyes Chilpa (2012, 48).

⁴The Instituto Médico Nacional (1888–1915) carried out research on *cihuaptl* for several years and published various theses in pharmacy and medicine on this plant in the pages of its review, including the following: Altamirano (1895); Reza (1887); Cota (1897 [1883]); García Peña (1897). On another plant used to induce parturition, see Caderón (1896, 36–42).

Women's Medicine in *Cuatro Libros de la Naturaleza* (1615)

Cuatro libros de la naturaleza contains four books divided into a total of nine parts, a division inspired by Theophrastus. In Europe of the sixteenth and seventeenth centuries, medical texts were compendia of prescriptions bearing on medical and surgical knowledge. They listed the commonest ailments and the therapies applied to combat or cure them, often accompanied by a description of an antidote describing how to prepare, dose and apply the simples and compounds of animal, vegetable or mineral extraction (Pardo-Tomás 2000, 25–40).

Like a herbal, Ximénez's work opens with the description of the physical characteristics of the plants and their medicinal properties, their forms of preparation and their whereabouts. The first book is devoted to trees and shrubs, divided into three parts: "On aromatics," "On trees," and "On shrubs and their fruit." The second book has two parts: "Sharp and mordant herbs" and "Bitter herbs." Book III also contains two parts: "Saline and sweet herbs" and "Acidic, sour and insipid herbs." Book IV contains "Animals" and "Minerals." The work also contains two alphabetical indices: one of the medicinal simples, and one of the cures for all types of ailments and their causes.

One of the main differences from other works on *materia medica* of its time is that *Cuatro libros de la naturaleza* did not set out to revise what had been said in the texts of classical antiquity in the light of humanist philosophy (Grafton 1995, 161–162), but to understand a different medical and therapeutic tradition, even if this knowledge was later accommodated within the precepts of a renewed Galenism. The result, however, of this extraordinary undertaking went beyond the aims of the author and his informants. Francisco Hernández was sent to New Spain to survey resources that could be useful for medical purposes. This was what Philip II stipulated when he gave him the task of describing the natural history of the new American lands with an emphasis on the medicinal plants. Hernández was also required to investigate the type of physicians, their knowledge and the ways in which they used medicinal plants in the New World. Hernández was to pay particular attention to those medicines that could be put to good use in Spain (Álvarez Peláez and Fernández González 1998, 26).

If the plants of the Old and New Worlds were considered the most valuable gift of nature, they were also one of the principal resources to encourage the broadening of markets at a time of expansion of the colonial empires in the following centuries (Pardo-Tomás 2002, 77–126). According to Antonio Barrera-Osorio (2006), it was the last resort economic and political interests that clearly defined the type of objectives and instruments in the production of knowledge in the sixteenth century.

As José María López Piñero and José Pardo-Tomás have shown, there are few analyses of *Cuatro libros de la naturaleza* in spite of its being one of the Hernandine texts that enjoyed a wide circulation. Among the formal differences between the “Madrid” and the “Rome” editions that they discuss is the difference in the organization of the text. Ximénez does not contain the prolegomena that Recchi included, and which they consider to have no connection with the text of Hernández. The first part of Ximénez's first book, on the other hand, corresponds exactly to the second book of the Roman edition, but this is not true of the succeeding books, which reflect both additions and subtractions on Ximénez's part. They also pointed out the important advantages of Ximénez's translation vis-à-vis the Roman edition (López Piñero and Pardo-Tomás 1994, 121–126). Although Ximénez himself had not received any academic training, he was immersed in the same setting that Hernández had shared: the Hospital de Santa Cruz in Huaxtepec (Oaxtepec, Morelos). This enabled him to corroborate, enrich or contradict the original information collected by Hernández. Ximénez's hand can be traced in the additions to the synonyms of plants in Spanish, Náhuatl, Otomi or Tarasco, as well as in the incorporation of prescriptions.

It can be added that Ximénez incorporated some typographic insets in the first and second books that were intended to alert, encourage or discourage the reader from using certain plants. It is interesting that these insets refer to plants that produced a strong effect on their users. The use of these insets is not completely systematic, so it is unclear whether they are the result of problems directly connected with the printed process carried out in the house of the widow of Diego López de Dávalos,⁵ or whether they were used only for those plants that were considered the most important. These insets appear to be particularly important in connection with zapote blanco, cacao, tobacco and ololihqui (Sarabia 2014, 47–74), or to indicate the different effects of plants like pinahuizxihuitl on indigenous people and Spaniards. Unfortunately we lack more information to settle this question, but it is certain that these fourteen insets are proof of the expertise that Ximénez acquired in the dispensary of the hospital in Huaxtepec.

The Importance of a Text on *Materia Medica* for the Discourse on Women

The publication of *Cuatro libros de la naturaleza* took place a little less than a hundred years after the conquest of México, Tenochtitlán. At that time, European fruits and vegetables that had been acclimatized by natives and Spaniards were on sale in the city markets (Gruzinski 2010, 40). Exchanges, barter and dishonest trade took place in the markets, as Alonso de Molina (1514–1585) informs

⁵Diego López de Dávalos was an important printer and editor of text form New Spain in the seventeenth century. After his death in 1613, his wife continued his work.

us in his *Confesionario mayor en la lengua mexicana y castellana* (1569). The merchants took advantage of the “Otomi” *indios*, children and anyone else they could trick. It was common practice to dye cacao green to make it look much riper. They would also adulterate good cacao with avocado pits, or mix styrax balsam with leaves or wooden “horseshoes” to increase its volume (Molina 1569, 37r). In the meantime, what happened to women's therapeutic resources? How can we unearth the bodies of knowledge that were produced by women, buried within disciplinary traditions such as natural history or the medical practices of the past?

Londa Schiebinger has found that a large number of the eighteenth century studies of natural history and medicine were based on the imperial expeditionary enterprises in America, the transformations of systems of botanical classification, or the role of the commercial exploitation of American green gold (quinine, coffee, tobacco, sugar, indigo, cassia, gum, aloe, sassafras root or bark from Brazil, balsam from Peru, ipecacuana jalapa) (Schiebinger 2004, 8). Of course, these studies have dealt with the political and economic expansion of the European powers on a world scale, prioritizing the theme of the circulation and appropriation of knowledge, but there have been few studies of other historical aspects that necessarily refer to other spaces and practices in the process of understanding the natural world.

The Hernandine corpus has made it possible to write various chapters of natural history and its imprint on the European world. In Mexican historiography, they have been essential sources for native botany and *materia medica* and for the analysis of the processes of exchange between the local and the European cultures (syncretism and/ or acculturation). They continue to be an important source in ethnobotanical studies. And, although they have been used to write several chapters on women, an analysis that takes the work as a whole has yet to be conducted.

Cuatro libros de la naturaleza tells us how it was read and about the spaces in which it circulated. It was primarily a prescriptive reference manual for use in the missions, but also to help the sick in the villages and settlements far from medical aid. It was by no means aimed exclusively at a female public, even less at those native women who had preserved their therapeutic knowledge by means of oral tradition. *Cuatro libros de la naturaleza* contains a systematic body of knowledge about the ailments and therapeutic resources of women. Its importance grows all the more if we consider how little has been written on native women in the sixteenth century.

Historians working on the topic of women of New Spain have repeatedly complained about the lack of sources. Of course, we can find information in the chronicles, natural and moral histories in so far as they tackled aspects of

everyday life, some of them particularly concentrating on the women of the aristocracy (Socolow 2000, 17). Furthermore civil and judicial legal proceedings and the archives of convents provide useful information about women of various *calidades* in New Spain from the beginning of the sixteenth century (Díaz 2013; Martínez 2008).

At this point, it is tempting to turn to sources that were not conceived for or aimed at women, following the methodological proposal of some feminist historians who consider that those who are interested in talking about subjects who have left few material traces of their history or only historically fragmented records should engage in reading against the grain. It does not matter whether we use one document or several: this type of research concentrates on the possibility of construing our histories from other sources that allow us to construct dense contexts for realities that permanently slip through our fingers (Chaudhuri, Katz, and Perry 2010). In her study of the inquisitorial trial of Fátima, a Muslim slave in Spain in the sixteenth century, Elizabeth Perry (2010, 5) has shown that the methodological use of a diversity of documentary sources (genuine documents, chronicles of rebellions, literary criticism), read from their subtexts and silences, could yield more information than the questions and answers of the inquisitorial trials (androcentric official documents) that formed her documentary corpus.

Unlike certain groups of noble women in Europe, Indian women in New Spain did not know the art of writing.⁶ During the last decades of the sixteenth and the first half of the seventeenth century, it was exclusively men who wrote books on medicine and surgery printed in New Spain. When they devoted chapters to the health and ailments of women, this was generally in terms of their referents: European women. All the same, they were unable to ignore the intensive exchange of therapeutic resources that took place between women of all ranks. The prescriptions or antidotes of these writers are an implicit testimony to such exchanges. As Harold J. Cook (2005, 101) has written, at the moment of defining the authorship of the texts that were written about the New World, they give a strong impression of having been written as the result of unique, personal experiences, acquired independently of collaboration or interaction with other systems of knowledge.

What Cook said is clearly expressed when we moved to the space of New Spain. In printed texts on medicine and surgery in the late sixteenth century and early decades of the seventeenth century, the specific women's health chapters

⁶There are manuscripts in Europe written for women by others or by themselves to guide their activities in the domestic space in the fields of medicine, cosmetics and cooking. These texts generally circulated among women of high rank within a family setting. An example is the *Manual de mujeres en el qual se contienen muchas y diversas recetas muy buenas*, by Martínez Crespo (1996). Domestic medicine paid particular attention to women's ailments—generally connected with pregnancy, childbirth and the postnatal period—and their treatment.

where commonly used, even though there is a large absence of women's voices. The doctors, in some cases, had to resort to women of different *cualidades*, especially when it came to native medicinal plants. Nevertheless, they never felt the need to mention their sources, for example: Ioan de Barrios (1563–1645), a physician born in Colmenar Viejo, which was located in Madrid, Spain, who arrived in New Spain in 1589 (González 1995, 137). In his *Verdadera medicina, cirugia y astrologia* (1607), Barrios devoted a whole chapter to women's anatomy and ailments without saying hardly anything about native women. However, in his *Tractado cuarto de todas las yervas [...]*, based on the Recchi compilation of Hernández's *materia medica* (Barrios 1607, 65r–65v), Barrios lists women's ailments and their remedies as Recchi had selected them. This text therefore matches that of Ximénez, because they both drew on the same source.

The ailments described by Barrios are all connected with matters affecting the uterus, menstruation and the expulsion of the placenta or the stillborn child. He also provided remedies to ease giving birth, to promote fertility and to avoid the risk of natural abortion (*mal parir*), as well as postnatal care, lesions to the external sexual organs (*llagas en las partes bajas*) and other matters affecting the same area. However, generally speaking, the information contained in the *Tractado cuarto* is very general and synthetic and fails to do justice to the selection carried out by Recchi. For instance, he condenses fifteen plants within a small space for uterine complaints (*mal de madre*) and twenty-eight medicinal plants to reduce the menstrual flow, sacrificing much of the information related to the preparation, application and dosage of simples and compounds.

In this respect the *Antidotario* of López de Hinojosos (1535–1596), or the *Cuatro libros de la naturaleza* of Ximénez provide better information regarding local plants. In his *Summa y recopilación de chirugía con un arte para sangrar muy útil y provechosa* (1578, second edition 1595), López de Hinojosos (1535–1597), who was a barber surgeon, recognized for his expertise (Martínez-Hernández 2011, 461), devoted a whole chapter to problems connected with pregnancy, childbirth and postnatal complications (Lopez de los Hinojosos 1595, 204). He did not refer explicitly to native women, but the “Antidotario de las drogas que van en este libro” with which he concluded the work indicates that he was aware of the practices of native women, many of which were also used by Spanish and Creole women.

Juan de Cárdenas (1563–?) was a doctor from Spain. He differentiated between the physiology of Spanish women and their native counterparts in his *Problemas y secretos maravillosos de las Indias* (2003 [1591]). Like his contemporaries, he included native therapeutic practices, particularly the use of tobacco. This plant was used to treat uterine pains and obstructions. Like the physicians and surgeons of New Spain, Cárdenas (2003 [1591], 194) recognized tobacco

as “the strangest form of medicine ever imagined in the art of medicine.” The physician attributed a multitude of applications to tobacco and recognized that it was good for men and women, Spanish and native, who masticate it or ingest the smoke through a cylinder of dried tobacco leaves (Cárdenas 2003 [1591], 194).

The texts referred to above conform to the dominant conception of Galenic physiology, in which the menstrual flow was part of the main system to explain women's ailments. However, one of the novelties of these texts, which were inspired by and aimed at the context of New Spain, is the incorporation of local therapeutic knowledge maintained and passed on by native women to other women, even though they are not mentioned explicitly in the texts themselves (Pardo-Tomás 2011, 93–108).

Another contribution in this field was the *Tratado breve de medicina y de todas las enfermedades* (1592) by the Augustinian physician Agustín Farfán (1532–1604), though the coverage of women's ailments was shorter than in the 1579 edition of the work. Farfán (1592, 35) advocated the use of cupping or ablutions (chamomile, dill, rue, fennel, mallows and wormwood) to the feet to reduce the menstrual flow, as well as going into detail on the treatment of uterine ulcers.⁷ Of the previous texts, this is the one that probably incorporates women's voices the least.

The domestic space and the market played a key role as the natural place for exchanges between women. Moreover, as Susan Migden Socolow (2000, 40) suggests, the native women soon became “cultural interpreters” between the conquistadores and the conquered. Native women were obliged to work as cooks, servants, nurses and washerwomen and played a major role in the domestic life of the Spaniards. Hugh Glenn Cagle (2012, 185) has noted the same phenomenon with regard to women in Goa. They worked in the most intimate of all colonial spaces: the homes of the Portuguese, and like the native women, they had a reputation for knowing about native botanical systems and the medicinal properties of plants. It was women of every *calidad* who frequented the markets and squares of Mexico City, Huequechula or Toximaroa to buy peyote in New Spain (Sarabia 2014, 21–39). These markets were full of vendors selling herbs, flowers and roots along with advice on how to use them as food or for medicinal purposes. These

⁷For these, he proposed gourd powder and collyrium, or Lanfranco water, which should contain alum, verdigris and white wine. He considered that “lesions and inflammations are commonly found in the genitals too, due to the choleric nature of menstrual blood or too much intercourse.” His remedy was the application of a rinse with dried roses, violets, barberry, rosemary, olive leaves and a little rockrose, when available. After these plants had been boiled over a slow fire, the resulting solution should be applied once a day. He also proposed the preparation of an unguent of pumpkin seed oil, poppies, sweet almonds, sesame, rosé, lard, egg white and white lead powder. To treat uterine gangrene he recommended Egyptian unguent. It is interesting to note that he proposes the same treatments for complaints of the sexual organs of both women and men (ulcers, inflammations, gangrene), Farfán (1592, 203–204v).

spaces were the scenario of intense exchange as well as of disputes and social tensions.

A Classificatory Proposal

A little more than 460 plants are discussed in *Cuatro libros de la naturaleza* by Ximénez, 81 of which were prescribed for problems connected with the menstrual flow, the uterus, childbirth, infertility or the production of breast milk, among the most important. In other words, these were conditions connected with reproduction and the female sexual organs, although not all of them were exclusively for women. The same plant could be used for various purposes and be recommended for men and women alike. Modern chemical analysis of some of these plants has demonstrated their capacity to facilitate flow in the pelvic zone, to produce contraction of the uterine muscle, to heal wounds, or as a painkiller, purgative or narcotic.⁸ Most of them, however, still await botanical identification and laboratory analysis.

Two major systems are applied to classify the therapeutic action of plant resources. On the one hand is their purgative action. According to Fresquet, purging and bloodletting were considered the “main remedies” in Europe, although other techniques were also in use such as vomiting, leeches, cupping, baths, clysters, exercise, rubbing and diet (Fresquet Febrer 1993, 76).⁹ The use of purgatives and bloodletting were deeply rooted practices that persisted through the Renaissance down to the Enlightenment. Both have been crucial in Galenic medicine, though with important differences. Practitioners of iatrophysics tended to defend bloodletting, although some of them refused to apply it (Puerto Sarmiento and Alegre Pére 2001, 168–169). Nevertheless, in *Cuatro libros de la naturaleza* the search for the purgative action of plants is only mentioned. However, it did not refer to techniques of venesection as a therapeutic adjuvant.

A different type of plant classification at work in *Cuatro libros de la naturaleza* is the Galenic doctrine of qualities and degrees, a permanent feature of European treatises on simples and antidotes in the sixteenth century. This doctrine proposed a quantitative classification of the medicinal action of active substances and enabled advances in dosage, a theme that persisted in pharmacology

⁸The botanical identifications are: cempoalxochitl, *Tagetes erecta* L.; chilli, *Capsicum annum* L.; cihuapatli, *Montanoa tomensosa* Cerv.; mecaxochitl, *Piper amalago* L. 1, *Piper auritum* H. B. K.?.; xocoxochitl, *Pimenta officinalis* Lindl; yoloxochitl, *Magnolia* sp. *Talauma* sp. according to Waizel Bucay (2006, 187). While these plants are cited in *Cuatro libros de la naturaleza*, we need to deepen from an interdisciplinary perspective to clear its medicinal action.

⁹For native opposition to bloodletting in New Spain, see Pardo-Tomás (2014, 41–65).

in subsequent centuries.¹⁰ Not only simples and compounds, but also bodies and ailments were classified. Investigation of the links and differences between these two systems, however, would go beyond the limits of the present contribution.

What should not be forgotten is that classification inevitably leads to the question of a hierarchy and evaluation of certain features, elements or characteristics. Classification is an indispensable part of any process of knowledge formation. A key theme in *Cuatro libros de la naturaleza* was to name and differentiate the world in order to easily access and manipulate it. This was due to the inclusion of the conceptions of the primary author, Hernández, with regard to pre-existing classifications of the natural world, of bodies and of ailments.

The classification presented here is only provisional because it depends on the values that are taken into account in establishing the organizational principles of women's medicine. In this case, plants have been selected that meet at least one of the following criteria: a) the generic name of the plant directly refers to women or to women's medicine; b) the description in *Cuatro libros de la naturaleza* contains a direct reference to the plant as specific to women in spite of being used in other types of ailment, in other words, it is used in connection with more than three women's ailments; c) the local appreciation of this plant (when it was available).

Women's Medicine. A Preliminary Study

As Evelyne Berriot-Salvadore (2003, 390) has pointed out, Galenic physiology justified a female physiology based on dysfunction, condemning women and their bodies to an inferior status vis-à-vis men. These ideas were in line with the pre-existing social arrangement. In this theory the menstrual flow became one of the key systems of Galenic physiology. These Galenic notions of menstrual flow are present in *Cuatro libros de la naturaleza*, although in many respects attenuated by the influence of native ideas about women's health. Ximénez still considered the retention of the menstrual flow to be a symptom of an ailment. In the medical treatises of the period, retention was usually considered to be a symptom of an obstruction, and thus of a concentration of thick and phlegmatic humors which needed to be dissolved. Various plants were applied to remedy this problem and others connected with menstruation, either to promote the flow, such as

¹⁰Fresquet Febrer (1993, 73) states that the doctrine of degrees was basically defined as the "excess of heat, moisture, dryness or cold. These degrees made it possible to classify medicaments and their action on the organism." As he notes, this classification established a unit of measure of the active substances in quantitative terms while also contributing to progress in dosage.

xiuhtotonqui¹¹ or oregano of Cuernavaca (Ximénez 1615, 108v), or to staunch or regulate it.

Following Hernández, Ximénez (1615, 126 and 142) sought to retain the flow of women when they were pregnant or had just given birth, recommending chichiantic and axuchiatl for this purpose. Painkillers and narcotics such as nextlaçocolli from Yacapichtlan were given to woman after childbirth to relieve uterine pain, or ololihqui to strengthen the hips.¹² Exchanges in the therapy of women in New Spain were not long in making their appearance. Alonso López de Hinojosos (1595, 191v) included a recipe consisting of aristolochia, epazote, cihuapatli, honey and oil to reduce the flow.

As in every medical treatise, in *Cuatro libros de la naturaleza* the blame for infertility was placed on the women. Among the recommended treatments were oceloxochitl¹³ or atehuapatli.¹⁴ Other plants were recommended to increase the flow of breast milk.

Tobacco was one of the narcotic plants that had the benefit of affecting the uterus and menstruation. Ximénez noted that when its leaves are applied, "the uterus is conducted back and returns to its place in a moment, the fainting disappears, and it could even be justifiably claimed that it dispels death itself, which already seemed to have held the weak and delicate body of the sick woman in its grasp with such an exhausting affliction." Tobacco could be taken or applied in the form of smoke to clean the uterus. Tobacco taken as snuff is comforting, decreases fatigue and "it seems that a disregard and oblivion of the animal faculty enters the spirit, which we may call intoxication as the devotees say" (Ximénez 1615, 94v). Tobacco was one of the most efficacious plants when its smoke was used to cure the ailments of women of every station. This was the verdict of the treatises on medicine and surgery like that of Juan de Cárdenas that were published in New Spain.

The commonest among the forms of preparation of the medicinal plants were coctions, grindings or dry powders which could be inhaled or dissolved (usually in a maize-based liquid). The medicine might come from part of a plant or the whole plant. Other practices included "mouthwashes, draughts and gargling,"

¹¹Xiuhtotonqui is a plant with many uses, including encouraging the onset of menstrual flow, Ximénez (1615, 112).

¹²Ximénez (1615, 127 and 162v). Ololihqui was generally used for "broken or dislocated bones," and other complaints. It mitigated the pain caused by syphilis and ailments resulting from cold such as flatulence and swellings, Ximénez (1615, 77v–78).

¹³Oceloxochitl is classified as *Tigridia pavonia*.

¹⁴Ximénez (1615, 150v) noted that oceloxochitl was abundant in the cloister of the convent of Santo Domingo; "some say that if women drink it, it helps them to conceive and to make them fertile." Atehuapatli: "when drunk, the root helps omen to conceive, it is mainly taken with what is called chilatolli and obstructs vomiting," Ximénez (1615, 145). It is now classified as *Achimenes coccinea* Pers.

cataplasms, ointments or poultices (Waizel Bucay 2006, 184). It should be kept in mind that medicinal therapy was not the only form of treating women's ailments, for there was a wide range of therapies involving cold or thermal baths, diet and rest, which should be included in any analysis of the therapeutic techniques related to women's health.

Domestic Space as the Domain of the Women's Medicine

The domestic space was the domain of women's medicine. *Cuatro libros de la naturaleza* dealt with plants to expel the afterbirth (*paras*, also known as *secundinas* in the treatises), a stillborn baby or to speed up birth (three events that often occur together). Yauhtli was used to bring on menstruation, expel a stillborn child, to treat uterine complaints and to stimulate milk production.¹⁵ It was considered very efficacious for thinning thick and tenacious phlegmatic humors, which caused obstructions. Besides recognition of its medicinal effects, it was also considered a good candidate for acclimatization in Spain. Although in *Cuatro libros de la naturaleza* this point is not explicit, it is very probable that it regarded this plant as a useful medicine for women in the Iberian Peninsula:

I conjecture that if it were taken to Spain it would do very well in the soil of Madrid and would be a great and beautiful ornament for the gardens of the King.¹⁶ (Ximénez 1615, 84–84v)

Unfortunately information about this plant stops at this point and the text does not go into it any further.

Another important plant in this work is the tlalquequetzal¹⁷ (yarrow), which like the cihuapatli, adorned the pots and gardens of the women (Ximénez 1615, 107v). Ximénez follows Hernández when he writes that the natives held this “feather of the land” in esteem, as they considered it as one of the “gift herbs.” Women with uterine pains appreciated it, as well:

It is a diuretic, stimulates menstruation, comforts the stomach weakened by cold, applied externally or in a potion, while the powder alleviates flatulence, stops belly flows, heals lesions in the external sexual organs, dissolves tumours and swellings, clears obstructions, mainly of the uterus, is an invigorating tonic that restores nat-

¹⁵In *Cuatro libros de la naturaleza* this plant was recorded as yyauhtli, but orthographic convention currently writes Yauhtli (*Tagetes lucida* Cav.).

¹⁶The Spanish original: “[si] se llevase a España á lo que yo puedo alcanzar con mi conjetura se daría muy bien en tierra de Madrid y aun seria de mucho ornamento y hermosura á los jardines del Rey.”

¹⁷The botanical classification of this plant is *Achillea millefolium* L.

ural heat that has been debilitated for many days; crushed and applied as a poultice it cures the scabies that often affects the heads of children, through its astringent and drying quality, its smoke benefits drowning of the uterus when blown through a cylinder into that part or powdered and administered in whatever drink is most convenient, it eases childbirth, causes dilation and expels the afterbirth, when drunk it combats diarrhoea in both children and adults, and some declare that when its juice is ingested through the mouth in the quantity of five ounces, it purges the humours by vomiting.¹⁸ (Ximénez 1615, 107v–108)

Cihuapatli was a plant appreciated by women.¹⁹ *Cuatro libros de la naturaleza* continues that it was very common to find it planted in pots to embellish the corridors or windows of the homes of native women. They would hang them from racks to have a supply ready at any moment. Hernández noted some twenty varieties, but he concentrated on a species that he called *cihuapatli emonítica*:

A coction of it is given to those in labor in a quantity of three or four ounces to ease the childbirth with great success, the coction or juice is very good for the breast, the leaves are macerated in the quantity of a handful and administered to drink in water or some suitable liquor, they ease swellings of the uterus, cure dropsy and stimulate menstruation.²⁰ (Ximénez 1615, 103–103v)

Another species of less importance is the *cihuapatli mayor*. The description is brief and concise, but no less adequate. The epithet *emonítica* is applied because it resembles the hemionitis described by Dioscorides; according to Hernández, the

¹⁸The Spanish original: “mueve la orina, provoca la regla, conforta el estomago debilitado por causa fría, aplicada por de fuera, ó dada a beber, hecha polvo, resuelve las ventosidades, detiene los flujos del vientre, cura las llagas de las partes inferiores, resuelve los tumores, é hinchazones, abre las opilaciones, mayormente de la madre, repara y restituye la fuerza, y el calor natural debilitado de muchos días, majada y aplicada en forma de emplasto, cura la sarna que suele nacer en la cabeza de los niños, mediante la virtud astringente y de secante que tiene, aprovecha su perfume y sahumero al ahogamiento de la madre [útero], aplicada en calilla, por aquella parte, ó dando a beber su polvo en aquel licor que se echare de ver ser mas acomodado, facilita el parto, abre y expelle las pares, detiene las cámaras, así de los niños como de los mayores bebiéndola, y algunos afirman, que tomando su zumo por la boca en cantidad de cinco onzas, purga por vomito los humores.”

¹⁹Recent chemical analyses have used molecules of zoapatle substances, but it does not have the same effect as when the herb is taken in an infusion. Its oxytocic action may therefore depend on synergy among different compounds of the plant, Castillo, Quijano, and Reyes Chilpa (2012).

²⁰The Spanish original: “Se suele dar su cocimiento á las que paren en cantidad de tres, ó cuatro onzas, para que más fácilmente paran a luz, con buen suceso el cocimiento ó zumo es útil grandemente al pecho, las hojas majadas en cantidad de un puño, y dadas a beber en agua, ó en algún licor convenientemente, aplacan las hinchazones del vientre, cura la hidropesia, provoca la regla.”

Spanish women of New Spain called it *hierba de la madre* (herb of the uterus). Not only was cihuapatli given an epithet of Greek origin, but it also passed successfully into the world of the Spanish women (Ximénez 1615, 103–103v). The plants listed by Hernández continued to preserve their name in Náhuatl or, in few cases, in a different indigenous language. The hybrid cihuapatli emonítica expresses the movements, transformations and linguistic changes that were surfacing within a few decades of 1521 (Gruzinski 2010, 40).

Sahagún and Martín de la Cruz also mentioned cihuapatli. It continued to be used with success by empirical midwives in the nineteenth century and was used by university physicians for the same purpose: to speed up childbirth. Modern chemical analysis has classified it as an agent for stimulating flow in the pelvic zone and producing contraction of the uterine muscle. The ample bibliography on the subject is an indication of its exceptional role among the other emmenagogue herbs.

Generally speaking, plants with this property were used to treat retention of the menstrual flow and their use was always preceded by retention of the urine or some other type of obstruction, which was a recurrent theme to explain retention in any part of the body. This is why the strategy to remove the difficulty was connected with the action of opening, clearing and getting the blocked flows to move freely again, which were almost always obstructed by “thick and tenacious humours.”

Cuatro libros de la naturaleza recognizes that the uterus was subject to pains and drowning. Although leaving out the Hippocratic notion of the movement of the uterus within the body, this text recognizes that the uterus does have specific, limited movements. The native remedies for the uterus are derived from a diversity of plants that had the capacity to maintain the uterus in place or drive it back to its proper place. They included the application of copalquahuitl (copal resin) smoke or a compound of copalquahuitl mixed with gum, tecamahaca, grey pitch (turpentine resin) and Campeche wax.²¹

The large absence in *Cuatro libros de la naturaleza* is any reference to the provocation of abortion, which was enveloped in silence. Bernardino de Sahagún provided a wealth of information about natural abortion and abortion through negligence on the part of the woman or some relative. This raises the question of the assumptions about gender that informed Hernández' writing; there is no neutrality of the “questioner,” the term used in the *relaciones geográficas*. On

²¹ Copalquahuitl, the copal resin tree, was considered the source of a major remedy for all ailments produced by cold, including headache and “drowning” of the uterus. It was recommended to use the smoke from its resin when mixed with other compounds: “Gerroto [Ceroto] mexicano recibe. Copal. Incienso de la tierra. Estoraquelido, que es el aceite de Liquidambar, de cada uno una onza. Tecamahaca. Aceite común. Goma de Liquidambar. De cada uno dos onzas, Pez griega. Cera de Campeche. Cuatro onzas de todo derretido, y misto se haga, ungüento” Ximénez (1615, 10v–11).

the other hand, it has to be taken into account that this silence regarding abortive practices was conditioned by the decline of the native population.²² Despite their absence in the record, the clearly destabilizing character of such practices must have played a fundamental role in the process of instilling the Catholic faith.²³

Francisco López de Gómara (1511–1566?) recorded in his *Historia de la conquista de México* that in the time of Moctezuma, some of the women who were in his service as wives or concubines aborted under the persuasion of the devil, “taking substances to expel the foetus, or perhaps their sons would not have anything to inherit” (López de Gómara 2003, 179). In his *Confesionario mayor en lengua mexicana y castellana* (1569), Molina (1569, 33v) formulated various questions in order to ascertain whether any men or women had administered a potion to harm someone, or to make a pregnant woman lose her child. He asked the women directly whether they had drunk any beverage to “expel the dead foetus, by which you killed your son, or caused him to take ill, or gave him suck in a way that hurt him so that he could no longer drink at the breast, or lay on him as you slept and crushed him to death.” Molina also asked the women whether they had squeezed their belly to “move and kill” the child. Although he recognized that the women could cause the death of a child through involuntary causes, such as carrying heavy weight or making a sudden violent movement, he also recognized that they could exert a mechanical force on the uterus (Molina 1569, 34).

In theory, some of the emmenagogue plants listed here could have been used to provoke abortion or to control fertility. Ethnographic research has revealed the popular use of cempoalxochitl, which is apparently still sold today for this purpose in some markets in Mexico, but more information is required on this point (Waizel Bucay 2006, 341). Nevertheless, this does draw attention to the fact that the entry on cempoalxochitl in *Cuatro Libros de la Naturaleza* does not contain any information in this respect. Was it used in the past to provoke abortion?

For the author of *Cuatro Libros de la Naturaleza*, cempoalxochitl corrected and calmed the stomach; was a diuretic and stimulated the menstrual flow; was good for intermittent fevers; alleviated flatulence; and was an aphrodisiac. In a balsam it was a remedy for lesions and hemorrhoids (Ximénez 1615, 81–81v). Further ethnographic studies may throw light on its possible other uses.

²²According to Gruzinski (2010, 109), the native population in New Spain decreased permanently in the course of the sixteenth century. In 1560 it numbered little more than 75,000 inhabitants, possibly 2,000 Mestizos and 1,000 Mulatos. The estimate for 1569 is approximately 35,000, and only 25,000 by 1580.

²³According to Schiebinger (2004, 18), if a woman has tried to abort, she is frequently the object of strong social condemnation for having dashed the hopes of life of the child she was bearing. This makes it very difficult to investigate abortion and the use of abortive measures in the past because that knowledge is usually suppressed in the present.

Nineteenth-century *materia medica* virtually ignored cempoalxochitl, chilli, yauhtli, mecaxochitl and xiuhotonqui. The exceptions were yoloxochitl and cihuapatli, which, as we have seen, continued to be discussed in the texts of the eighteenth and nineteenth centuries.²⁴ In *Cuatro libros de la naturaleza* yoloxochitl was considered “an admirable remedy for sterility and to arouse the uterus.” Local trade in this plant was important in the sixteenth and seventeenth centuries. It was appreciated for its “beauty and pleasing appearance.” The plant “arrives in all of New Spain, and where it grows they take it over dozens of leagues to sell.” A cotion of the flower mixed with mecaxochitl xuchinacatzli, tlilxochitl,²⁵ colopatli and opossum tail had interesting medicinal properties (Ximénez 1615, 8–8v). As mentioned above, mecaxochitl and tlilxochitl are emmenagogue herbs. As for opossum tail, some chemical research has found prostaglandins, which help to ease childbirth, but this area too requires further investigation (Castillo, Quijano, and Reyes Chilpa 2012, 49). Yoloxochitl was studied in the *materia medica* texts of the nineteenth century as a cardiac tonic.

Provisional Conclusions

Ever since antiquity, women's medicine is a form of knowledge that has been produced by women themselves, but they are strikingly absent from the medical texts. Medical and surgical Novohispanic treatises (Barrios, López de los Hinojosos, Farfán and Cardenas) were no exception. The authors ignored the expertise of women, however, it is possible to recognize it in some of their works. There can be no denying that the women's medicine presented in *Cuatro libros de la naturaleza* embodies a more complex history than the simple aggregation or transformation in the conception of remedies from a native to a Galenic system. Women's role were conditioned by the gender system that prevailed in past societies. Women and men were in contact with plants, and both sexes had mastered the systems of botanical classification and forms of preparation and application, but they thought about them in different ways and put them to very different uses. In *Cuatro libros de la naturaleza* it is gender that is the principal factor in the social construction of ailments, though later race or social class were also to become a component in the definition of women's ailments. As Socolow has argued, the latter two categories (race and social class) were capable of transformation, but not gender. It was the determinant social factor in the formation of the individual

²⁴The Instituto Médico Nacional included cihuapatli in *Datos para la materia médica mexicana* in 1894 under the name zoapatle, *Montanoa tomentosa*. That document shows that the plant was widely accepted by physicians and used in public and private hospitals to induce contractions; it was also used by midwives. However, it was also recognized that applying it at the wrong time or in the wrong dose could cause irreversible damage (necrosis of the uterus) or even lead to the death of the mother.

²⁵This plant is classified as *Vanilla fragrans* (Sal.) Ames, *Vanilla planifolia* Andr.

identity of both women and men, whose roles are social constructs, not natural entities.

The emphasis in *Cuatro libros de la naturaleza* on the presence of emmenagogue herbs in pots, gardens and hanging from racks in the domestic spaces of native women should lead us to reflect on the control of their resources and therapeutic practices, as well as on how the domestic space of women of different *calidades* was the site of intensive interactions, contacts and transformations in the therapeutic knowledge of women in New Spain. This is what the medical and surgical texts tell us that were printed towards the end of the sixteenth and in the early decades of the seventeenth century.

This contribution opened with the fundamental importance of Hernández as a source for medical and botanical research in Mexico in the late eighteenth and nineteenth centuries. The physicians and naturalists of the nineteenth and twentieth centuries emulated the academic historiography of their time, conferring scientific status on sources from the colonial past. All the same, they were selective when it came to developing lines of pharmacological research. Perhaps we may infer that one reason for this may have been the greater importance assigned to alkaloids than to other types of medical substances in that research. Alkaloids are molecules that have a strong effect on the central nervous system (painkillers, soporifics, tonics and, in general, all those substances that modify perceptions or state of mind). The physicians and naturalists claim to have maintained a firm commitment to the ailments of women, including of course those connected with pregnancy and childbirth, but the *materia medica* texts tell a different story. Our analysis of the therapeutic arsenal of emmenagogue herbs in Ximénez has shown the persistence of cihuaptli and yoloxochitl in Mexican *materia medica*, but what happened to the other plants?

From the perspective of the Anthropocene, we may ask further questions about the global impact of the Hernández' mission, especially its impact on the landscape and the domestication of wild plants. In future research it would be desirable to establish if the configuration of new natural identities from the natural history are also expressed in the transformation of the endemic flora. In other words, to measure whether this had an impact on the transformation of agricultural methods, in the domestication of wild species or in the disappearance of some endemic flora, etc.

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Chapter 8

Sheets of Paper, Tobacco Leaves: The Circulation of Knowledge About New World Plants Through Printed Books (Sixteenth and Seventeenth Centuries)

Mauricio Sánchez Menchero

The Green Gold

[1624/27. Travel diary]: We sailed from Peru [...] for China and Japan [...] taking with us victuals for twelve months; and had good winds from the east [...] But then the wind came about, and settled in the west for many days [...] So that finding ourselves in the midst of the greatest wilderness of waters in the world, without victual, we gave ourselves for lost men, and prepared for death.

[But] the next day about evening, we saw [...] thick clouds, which did put us in some hope of land [...] Wherefore we bent our course thither, where we saw the appearance of land all that night; and in the dawning of the next day, we might plainly discern that it was a land [...] And after an hour and a half's sailing, we entered into a good haven, being the port of a fair city [...]

The next morning early, there came to us [an] officer [...] and [he] told us, 'he came to conduct us take us to the Strangers house... Soon after our dinner was served in; which was right good viands, both for bread and meat: better than any collegiate diet that I have known in Europe. We had also drink of three sorts, all wholesome and good [...]. Besides, there were brought in to us great store of those scarlet oranges for our sick [...] There was given us also, a box of small grey or whitish pills, which they wished our sick should take, one of the pills every night before sleep; which, they said, would hasten their recovery [...]' (Bacon 1819, 81–86)

The author of this travel diary could have been none other than Francis Bacon who, at the age of sixty-five, was on the verge of death. He was a thinker who was interested in reflecting on the role the new American treasures should play in the

West. This involved imagining the building and development of a complex world that would emerge as a New Atlantis and as resulting from the innovations (Patent Roll VIII) of an *empirical* reality whose legal order the philosopher himself would develop (García 2006, 185–186). His approach was different from the fantasy tales about the East Indies elaborated in the past that depicted people and nature in both a monstrous and marvelous manner. That is to say, if before he dealt with literary abstractions that sought to bring order to a remote world, now, through the allegory of *New Atlantis*, Bacon placed these marvels in conceptualizations that facilitated control over the seemingly novel. For this reason, the philosopher took responsibility for describing a Christian population that spoke in a Latin language, like Spanish, which facilitated communication and movement of both their natural wealth as well as the knowledge produced from it. In this way, to place *New Atlantis* in an allegorical form:

in the interstice between America and the Orient, Bacon's text focuses on continuing European assimilative problems (both conceptual and practical) with regard to geographically remote regions. (Jowitt 2002, 132–133)

Due to his scientific and philosophical interests, Bacon developed a predominantly descriptive structure in reference to biology and medicine. An example is his *Sylva sylvarum*, or, *A Natural History: In Ten Centuries*, a work in which Bacon describes different experiments with minerals and plants. Of course, he could not leave out a plant like the American tobacco, which he briefly described, in addition to talking about its cultivation and medicinal uses. We can place this exchange of natural goods and agricultural knowledge in the early part of what Paul Crutzen classified as the Anthropocene. Before what would become the Industrial Revolution, Europe was shaped by the circulation of American plants which modified not only the type of agricultural crops included in the climate, but also the diets of foods, medicine and natural stimulants. Naturally, Bacon relied on the descriptions of plants originating from the East and West Indies that appeared in books published in Latin and English, sometimes accompanied with engravings.

However, in spite of having come across an American plant, or its description in books, not all naturalists or physicians in Europe were open to its therapeutic uses. Ever since the humanist Galenic tradition, there existed, in general, a skepticism toward *materia medica* from the New World, as was the case of Francisco Valles. On the contrary, some scholars in the circumscribed Paracelsian thinking showed a different attitude, thanks to the fact that they were more open to the collection of materials and experimentation, as was the case of Bacon (Gaukroger

2001, 175–176). Still, a humanistic author, like the doctor from Seville, Nicolás Monardes, was open to Paracelsianism and the use of American plants.

In this way, Monardes was responsible not only for the description of the plants that he grew in his garden in Seville, but also those he studied in his laboratory and experimented with in a therapeutic manner on his patients. As a result of these experiences, Monardes published a book in 1565, later reprinted in 1569, in which he included a list of the botanical products from the New World, without mentioning tobacco. In 1571, the physician from Seville would write and publish, for the first time, his own text on tobacco while also editing two French works on the same topic. They were *La maison rustique* written by the physician Jean Liébault in 1570 and the work by the Paracelsian Jacques Gohory *Instruction sur l'herbe Petum* in 1572. Monardes edited his work on tobacco starting with a word to the king in his dedication: the omission of said plant in his first book was due to the fact that it had not reached his hands like other plants had, such as the sassafras tree. However, there is no doubt that tobacco had already been introduced in Spain.

Focused on the culture of tobacco, Monardes' text provided an account in Spanish of its cultivation and medicinal uses surpassing in popularity the works of Liébault and Gohory. Here we must remember that Monardes' system of thought had an advantage over that of the French authors in terms of the time and experimentation invested in the natural resources from the East Indies, such as opium and other drugs mentioned by Dioscórides and Garcia da Orta. Monardes' reading of these was in a modern fashion, that is, not merely as an annotator or commentator of *Auctoritas*, but as a reader of science who knew how to cross-reference not only between one book and another, but also between plants and minerals (Eisenstein 1994, 52). In this way, he could compare, for example, tobacco and opium as stimulants which were needed in order to work without feeling hungry or thirsty and to walk long distances.

They use [...] such things [as tobacco] to remove fatigue [...] not only [...] In our Western Indies it is used, and it is a very common thing in the Eastern Indies. And also in India of Portugal, for this effect opium is sold in the shops, even as they sell *Conserva*, which the Indians use to relax from work, and to get high, and not feel bad from anybody ailment, or spirit that may appear: and there between them they call it *Aphion*. The Turks also use *Aphion* for this effect [...] (Monardes 1574, 49)

This pharmacognosy was the result of a matrix that Monardes used to organize the new discoveries generated by the American green gold. In addition, Monardes' work, translated into Latin in 1574 by Carolus Clusius (Charles de

L'Écluse), would be introduced to the circle of intellectuals and academics in medical institutions beyond the Spanish border. It would also reach a wider audience, for example, through the printed version in English, published in 1577, making his knowledge become a point of reference and consultation. In fact his work will be cited repeatedly and, therefore, translated into many languages.

Through his work, Monardes helped to disseminate knowledge about tobacco and added to the first catalog of diseases for which tobacco acted as a panacea. Monardes converted tobacco into a household remedy in Western Europe, and his results were accepted by the majority of physicians in Europe for more than two centuries.

In the final analysis, Monardes definitely helped not only in the mere description of the plant, but in the explanation of how it was used for therapeutic purposes in order to understand how it cured diseases and how it prevented them through hygienic cleansing. In reference to these properties, Monardes pointed out how tobacco:

Has virtue to heal and to dissolve, with some binding and comforting. It welds the fresh wounds, and heals them, as they say, by the first intention: *it cleans dirty wounds (sores)* and reduces them to perfect health [...] In old wounds, our Tabaco worked marvelous effects; it does heal them *and cleans them*, removing everything superfluous and rotten, making them perfectly healthy. (Monardes 1574, 42)

In his discourse, Monardes demonstrated the therapeutic properties of tobacco, which he valued much more than its uses as a decorative plant. This demonstrates that when it was first introduced in Europe, it was not perceived as a curative plant. The greatest curative richness, as Anthony Grafton points out, was eventually going to come from plants, not minerals:

[...] Monardes, the Spanish physician [...] judged the discovery of America far more valuable for its plants than for its mineral wealth because health was ultimately more precious than riches [...] (Grafton 1995, 162)

For Monardes, tobacco was just a sample of this wealth. Later, after characterizing the plant as hot and dry in the second degree, the doctor from Seville gave a long list of therapeutic benefits from various preparations: internal congestion, stomach ache, constipation, kidney stones, flatulence, diseases during pregnancy, halitosis, rheumatism, tumors (swellings), abscesses, cuts, ozena (rhinitis), de-worming, antidote.

Before proceeding to an analysis of the circulation of his work, it is worth bearing in mind that Monardes' interest for the American *materia medica* was not

altruistic nor exclusively scientific, but that it was related to the configuration of a commercial network of importation to distribute the American products from Spain to the rest of the European continent (Barona and Gómez Font 1998, 20).

Appropriation and Translation

Certainly one way to knowing how a man of science can develop a system of thought in a particular historical context is from language. In this regard, Quine noted,

Ideas are as they are, but words are outside where we can see them and hear them. And scientific theories—as speculative and abstract as they may be—are in words [...] there are no theories apart from words. (Quine 1973, 35)

This is true even more so in areas such as the biological and medical sciences where great care exists around a precise description of the different living beings and of the phenomena that appear in the diseases and their cure.

The origin of that effort is often placed in the construction [...] of a natural history based on description through personal observations of plants and animals in the different areas of the Old World and the immense territories that the Europeans were discovering. (López Piñero and Pardo-Tomás 1996, 22–23)

In this regard, it is no coincidence that Elizabeth Eisenstein has highlighted the role that the printers played not only in the dissemination, but also in the generation of knowledge, since, as she notes, a good part of the work that was an innovation in the fields of scholarship and science did not develop within the academic centres. The typography facilitated combined forms of action to emerge—both social and intellectual—which determined that the relations between the men of knowledge and the systems of ideas change (Eisenstein 1994, 54).

However, from our point of view, it is not a question of the predominance of publishers to the detriment of laboratories, botanical gardens or libraries. Rather, these spaces that generated knowledge accounted for the integration of a means of communication, like the typographical workshops formed by different agents, from printers and typographers, to traders and translators. The latter, for example, played a very important role in the dissemination of works that dealt with the American *materia medica*. Such was the case with John Frampton, who translated Monardes' work into English. In this regard, it is important to analyze this translation—according to Isabelle Pantin (2010)—under a triple feature of the translations in the medical area.

One element to be highlighted is that in the process of translation a couple of factors were at play, such as “the ideological motivations and commercial interests. While the latter remained relatively constant, the first of these were more mixed: obtaining prestige, the willingness to spread knowledge” (Pantin 2010, 173). Among other motivations, the propagation of ideas or the encouragement of the English vocation to explore, colonize and trade prevailed, as did, for instance, the company of the writer and translator Richard Hakluyt.

In this way, it should be remembered that Frampton was a merchant of the Bristol-Seville route who was not exempt from the economic difficulties that the Anglo-Hispanic trade brought during those times. In 1561, the Inquisition accused Frampton of possessing a Protestant book. Soon, he was imprisoned and tortured, and his ship and possessions were seized. Finally, the British man escaped and remained in Cádiz where he learned the Spanish language and formed a personal library. It is not known when he was able to return to British lands, but these experiences allowed Frampton to become the translator of at least six works including, in order of elaboration, the work of Monardes to the *Travels of Marco Polo*, the *Discourse* of Bernardino de Escalante or the *Art de Navigation* by Pedro de Medina. In essence, Frampton’s half dozen translations provided English readers a kind of schoolbook for marines and merchants with Spanish knowledge concerning geography, navigation and medical material from America (Beecher 2006, 103–122).

A second point to emphasize is that the translations to suit the needs of a professional group or institution, like the medical, generated “a special effort [to] promote the translations: on the one hand, medical works into Latin, as a symbol of their professional competence, and on the other, the vernacular languages, in order to facilitate the dissemination of useful knowledge about health” (Pantin 2010, 172). Frampton’s English translation was aimed at a broad audience, as he himself stated in the prologue to the work by the doctor from Seville:

And of the medicines mentioned above in the same work by Dr. Monardes, now merchants and others are taking them from the West Indies to Spain, and from Spain to here, England, by means of daily traffic, and due to the excellence of these herbs, trees, oils, plants, stones, etc. they have been known to be marvelous remedies for all diseases and injuries that can happen to men, women or children, who have left and largely abandoned the old order and form of medicine [...] (Monardes 1577, 3v.)

A third and last element to emphasize is that, in most cases, the works involved were translated “by doctors and [that] were destined for other doctors [...] in which special attention was made to the completeness and clarity of their content”

(Pantin 2010, 170). Nevertheless, there were also translations of medical books done by non-specialists. This was the case with Frampton, who, after leaving his work as a merchant, stated in the foreword:

[...] and now, without the pressure of the past endeavors of my old profession, I spend my time for the benefit of my country and I avoid idleness by translating three books by Dr. Monardes of Seville, the wise doctor, from Spanish to English [...] (Monardes 1577, 3)

Movement and Prohibition

The seeds and leaves of the tobacco plant first arrived in England like a bolt of lightning, as did its recreational consumption—smoking it in pipes. Only afterward were the voices of printed books and pamphlets with a medicinal and moral bent heard. In this regard, it is likely that John Hawkins was responsible for transporting plant specimens from Florida to England in 1565, that is, a decade before the publication of Monardes in English. Although there is no data to confirm this hypothesis, it is very likely that the species *Nicotiana Rustica* was introduced, if not by Captain Hawkins, then by someone from his crew. For their part, Mathieu (Matthias) de l’Obel and Pierre (Petrus) Pena (1570) linked tobacco cultivation in England with that of Portugal, that is, through Jean Nicot and the importation of the seeds of *N. Rustica from Florida*.

Another explanation of tobacco in England was put forth by Thomas Harriot in his *Brief and True Report of the New Found Land of Virginia* (1588). This scientist came to Virginia during the second exploratory trip (1585), where Walter Raleigh left him under the command of Ralph Lane to monitor and study nature. In order to identify the plants, like tobacco, Harriot (1588, 48) did not hesitate to take Monardes’ book with him. So, if Harriot explained how the settlers, both men and women, had acquired the habit of smoking pipes in the American colonies, it is very possible to think that upon their return they would have carried a cargo of seeds and tobacco leaves of the species *N. Rustica* with them. If in the English countryside the planting had prospered, then this was due to the fact that the settlers learned how to grow it from the Indians. In the cultivation of the *N. Tabacum* in England, it is generally agreed that it was introduced by Francis Drake, who would have transported it in 1586 after his expedition through the West Indies. Hakluyt tells us that as a result of Drake’s attacks against Dominicans he discovered tobacco in its species *N. Tabacum* (Hakluyt 1965 [1859], 746–747). In any case, it is not by accident that the two species *N. Rustica* and *N. Tabacum* coincided with the return of Ralph Lane and the settlers to England.

Here it should be kept in mind that the cultural history of the circulation of tobacco helps us to explain whether its appropriations were therapeutic, recre-

ational or commercial, for example, and how they were generated in the British world of the sixteenth and seventeenth centuries. That is, we can understand the discourse, the practices and the representations in relation to tobacco with a quick glance at its uses in England; some were positive, linked to curative aspects and recreation, and others were negative and critical, regarded as a source of vice, and inappropriate production and trade. Below are some brief examples written between the last years of Elizabeth's reign and the throne of James I.

In 1595, the pamphlet *Tobacco* by Antony Chute was published, just between the two first editions of Monardes' in English in 1577 and 1580 and the third edition in 1596. We know little about its author, only that he was a poet who liked to smoke tobacco in a pipe and that he was part of what was supposedly a secret society. For that reason, his discourse could not be one of a specialist, but even so he quoted authors like Jean Liébault and Charles Estienne, but above all Monardes, who he admired for his location in Seville and his proximity to people who were informed about the American colonies. In this way, Chute was able to build his discourse and mention the therapeutic uses of tobacco perhaps to ultimately legitimize its consumption. For example, Chute mentioned Paracelsus and the distillation processes to obtain tobacco in a solution. He said "drinking" tobacco in the morning was not desirable and also stated that the use of tobacco in a pipe, whether it was made of silver or clay, had medicinal benefits.



Figure 8.1: Antony Chute, *Tobacco*. London, Adam-Islip, 1595, 15.

At the same time, Chute's work led to another novelty: The graphic image of an indigenous man consuming tobacco gave way to that of a European smoking a pipe. Here we must remember how Monardes did not mention the consumption of tobacco by the white man, and instead by Indians and blacks in order to deter its use for pleasure. In addition, Monardes mentioned the consumption of tobacco with a cigar, but not a pipe, which was the more widespread use in the British Isles. Chute chose as his emblem a pipe rather than a knightly sword. He also took this opportunity to criticize pharmacists who sold the product at exorbitant prices. The likely reason why he formed a secret society, apparently to whom his pamphlet was directed, that is, to Humphreys King, was to counteract the greed of the apothecaries.

However, in 1604, King James I headed the English propaganda against the social use of tobacco. Of all the kings, he was the first and only one to write against tobacco. As we have already seen, the use of tobacco had been established as a social custom. Faced with this situation, the king published *A Counterblaste to Tobacco*. In the preface, he spoke of his patriarchal interest in taking care of the social body of the people. Therefore, he spoke out against the abuse of tobacco and urged people not to imitate the vice of the savage Indians. He made fun of the medical uses of the distilled tobacco. He said if perhaps it alleviated headaches or stomach aches, it also caused damage to the brain or harsh stomach ailments. The monarch also criticized the sinful habit, comparing it to drunkenness, which rendered men incapable of serving the commonwealth. And if tobacco taxes were very low at the time of his enthronement, James I did not hesitate to lower imports and increase the tax.

But in response to the declaration by King James I and its detractors, there were voices that defended tobacco for its medicinal use. This was the case with Dr. Edmund Gardinier, who published *The Trial of Tobacco* in 1610, in which he explained the results of his experiments with tobacco, and why he had learned to value and to defend it. In his argument, Gardinier went on to quote authors like Liébault and Monardes, although he did not cease to criticize the latter for referring to tobacco as a product of the devil. In his medical prescriptions, he considered tobacco to be a primary ingredient, in spite of its disagreeable taste. In addition, for very seriously ill patients he did not hesitate in prescribing gargling with tobacco and other preparations containing nicotine. He also recommended a mixture of tobacco for many diseases and tobacco smoke in the ears as a remedy for deafness. Gardinier was against chewing tobacco and opposed the use of tobacco only for pleasure because he warned that those who abused it would die.

Scottish professor William Barclay also defended tobacco in his work *Nepenthes, or the Vertues of tobacco*, published in 1614. In its pages, he criticized, with good humor, the simple consumers or "tobacconists" and, on the other hand,

defended the therapeutic value of tobacco. He made no contribution to pharmacognosy. On the contrary, he only confirmed, without criticism, the discourse of all those who saw tobacco as a panacea. And although he would have liked to give recipes on how to prepare the tobacco remedies, he indicated that its infusion and decoction could be harmful to those who had no experience. For this reason, he recommended that the medical preparations be left in the hands of doctors. In addition, the author, who was educated by Justus Lipsius in neostoic philosophy, warned his readers that tobacco was not for everyone because each person's temperament was different according with a Galenic vision. At the end of his book, Barclay would leave some poems that were similar to those by Edmund Spenser in *The Faire Queen* (1590) or by Sir John Beaumont in *The Metamorphosis of Tobacco* (1971 [1602]) that praised tobacco.

But in general, the rejection of the use of tobacco continued until the mid-seventeenth century, even for medicinal use. This refutation was made particularly by King James I and the greater part of the men of State and Church, as well as men of letters and scientists like Richard Brathwait, Joshua Sylvester or Thomas Thompson, among many others. However, as time passed, the recreational use of tobacco gained acceptance in the British Isles. In the main cities, the number of tobacco and pipe shops increased, as did cultivation of the plant, which became the main crop of several agricultural regions. In addition, pipe manufacturers obtained Royal Charter. James I himself, who had opposed the plant, understood that it could facilitate royal financing through tolerating and controlling its production and consumption. At the same time, the cultivation of tobacco became the mainstay of the newly created colony in Virginia for which the producers demanded protection. On the other hand, the king's income from taxes on tobacco was threatened by the success of the product in British territory. Therefore, it was not an altruistic proclamation by the king that prohibited the constant growth in England.

At the same time, the College of Physicians, in response to a letter from the king asking for their opinion on the quality of the tobacco grown in England, pointed out that the tobacco, which was produced in the south was better due to its maturity. Therefore, the judges were instructed to limit the cultivation and to request that the growers move outside of London. The proclamation of December 30, 1619, was the king's next step: "It is better to allow the importation of tobacco than to cultivate it in England." However, this royal proclamation would be ignored by the tobacco growers, who continued to defy the government until the death of James I and until the last decade of the seventeenth century. Among those, as we saw at the beginning, was Francis Bacon, who advised the use of some drugs, like opium, coffee, and of course, tobacco, as a way of preserving youth.

Conclusions

With what we have seen, we can confirm, once again, and in accordance with James A. Secord (2004, 654–672), the richness that comes from the study of the transmission of scientific knowledge through the analysis of books and their translations, as well as their reprinting or comments in pamphlets and images. This analysis of the circulation of knowledge under a comparative context in geographic form and discipline can be appreciated in the case of tobacco and its various appropriations and uses, particularly with doctors like Nicolás Monardes who reached the British Isles from his laboratory and garden in Seville, as we have seen. Since then, our analysis has been more concerned with the follow up of Monardes' work relating to tobacco as a communication process and its various appropriations in printed materials, such as educational or moralistic texts in the England of James I. All of which, in addition to avoiding parochialism, inspires wider reading to explain and understand the interactions, translations and transformations of tobacco and its written references.

The cultural history of tobacco and its discourses, practices and representations in printed material demands a much wider study to account for the cognitive complexity that this implies. Some lines of work that serve as an example are still pending. In reference to the images, it would be important to analyze them under the pictographic eyes of W. J. T. Mitchell (1994) in order to convert engravings, posters and still life into verbal documentation tools for the understanding of the daily use of tobacco by nobles and charlatans, drunkards and women, religious people and blacks. An analysis of the engravings of botanical descriptions of tobacco in various printings is also illustrative, for example, a comparison of the size of the works by Monardes, the English edition (19 cm 4 to), and the tiny Italian (14 cm) publication.

What also remains to be done, from the methodology of the book's history, is to explain Monardes both as a scientist and a merchant, for example, or Carolus Clusius, translator and literary agent of the Flemish printer Christophe Plantin. It should be remembered that "Clusius' translation of Monardes' *Historia Medicinal* began a process by which a large number of American species, previously unknown by European naturalists, was assimilated into European medicine." In the same way, it is necessary to study the readers, through their annotations in the margins of medical books or through the study of the bibliographies contained in private libraries. These are several fields that, after all, point to the challenge of explaining how and why men and women of the sixteenth and seventeenth centuries appropriated a plant like tobacco.

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Chapter 9

Underground Knowledge: Mining, Mapping and Law in Eighteenth-Century Nueva España

Nuria Valverde Pérez

The stone is a mirror which works poorly. Nothing in it but dimness. Your dimness or its dimness, who's to say? In the hush your heart sounds like a black cricket. (Simic 1989, 17)

While looking over the blueprint of the windmill he designed to pump the water that flooded the mines of the Harz region,¹ Gottfried Wilhelm Leibniz (1646–1716) probably wondered whether he would be more successful in draining the mines if the mountains were transparent. He envisioned the production of three-dimensional models that, combined with the chorographic maps of the zone, would provide a view of territory articulated beyond administrative boundaries (Hamm 1997, 84). Thus, besides contributing to the understanding of the geo-physical environment of mines through his (failed) machines, Leibniz helped to establish a new approach to mines as laboratories of Nature that could be replicated in man-made, artificial ones. Fictions of Nature's workshop provided German scholars with the rationale for presenting mines as the right sites for the discovery of the true structure of the Earth. However, the results of this seeming vindication of mines and miners' knowledge were ambiguous: whereas scholars defended the mines as places for the production of knowledge about the Earth (Hamm 1997), they also considered miners' knowledge somewhat unreliable, dimly empirical, and not adequately articulated.

Looking to the king's support, savants such as Leibniz and Johann Gottlob Lehmann (1719–1767) saw in a highly centralized administration the possibility of eliminating the hindrances and criticisms of local administration and local knowledge, which would allow them to freely explore and implement their theories beyond administrative borders and, hence, attain a continuous, "transparent" picture of the inside of the Earth. They were rather skeptical of the potential benefits of local rules and practices to an extensive understanding of the geology of a region. Moreover, their approach tended to blur the epistemic impact of

¹See Wakefield (2010).

local practices, reducing manpower to raw force.² This was not just eighteenth-century philosophers. Historians such as Wakefield, although committed to a re-evaluation of non-academic mining knowledge, ultimately relied on local actors' social class, cosmopolitanism, and academic background to ascertain their reliability.³

One of the obstacles that hinders considering non-academic knowledge as fundamental to the disciplinary constitution of knowledge is the epistemological and methodological limitation of the focus on technological innovation as the main factor to explain the successful development of industrial and regulatory ventures during the eighteenth century.⁴ An alternative perspective can be discovered by looking at the material conditions and practices that made room for the continuity and stabilization of a specific activity, such as mining. Focusing on mundane practices highlights the contingency of our categories,⁵ but also the inescapability of the relational world they unfold in and make occur. Analyzing the processes that lead to specific entanglements between practices and materials—by which practices affect materials, and the scarcity or availability of these allow new practices to emerge or old ones to be transformed—helps us better understand the historicity of their dynamic aspects. Manuel De Landa (2000) has given us insights on how this dynamic coalescence is determined by energetic demands, the accumulation of forms of knowledge, data, skillsets, and mechanisms of decision-making. From this perspective, the environment is a practice; or better, (an occurrence of) a set of dynamic relational practices. It is also unstable enough to be constantly harnessed by “mechanisms of sedimentation” that tend to stabilize the ontologies it produces. Mechanisms such as legal definitions, theological interpretations, and externalized memories (Leroi-Gourhan 1964) pave the way to routinization and crystallize the relations that they sustain and which sustain them.⁶

Routine is a basic feature that allows for the transformation of an economy of agglomeration into an economy of scale.⁷ The subsequent intensification of energy consumption is connected to an increasing determination of practices: and

²On the history of the divorce between intelligence and manpower, see Schaffer (1999).

³See Wakefield (2010, 188): “The mining officials in the Harz were not bumpkins. Many of them came from venerable old families and had been educated at Europe’s best universities. Some were local gentry; others, such as Harzingk, came from foreign lands.”

⁴For valuable criticisms and an evaluation about the consequences of this bias, see Edgerton (2010, 2007).

⁵See, as a very good example, Holtorf (2002).

⁶Standardization is one of the most important mechanisms for this sedimentation, and key to understanding the kind of irreversibilities linked to the intensification of energy consumption. See Leigh Star (1990); Bowker and Leigh Star (2000); Lampland and Leigh Star (2009).

⁷De Landa (2000, 90–91). Michel Serres (2001, 183) has stressed that these changes of scale imply changes in the cultural cognitive landscape and in the conception of science. His notion of “hominis-

the more determined they are, the harder they are to change and adjust; contingent connections became irreversible (This is probably what gives the Anthropocene, as Wendt defines it, its gloomy or fearful appearance). This process gains momentum and complexity—maybe even texture—with the generalized use of technologies and information, and strategies for linking information and materials to expectations and meanings. These last, so-called “soft technologies” serve two kings: they help to visualize and stabilize. We can locate them as tools for making some property emerge or sustaining its meaningfulness. In this chapter, I argue that the kind of entanglements produced by the specific demands of depicting mines in Nueva España produced an environment in the sense mentioned above: as an occurrence of a set of relational practices. And we cannot understand further bifurcations and unfoldings of the Anthropocene without taking into account the way these soft technologies helped to sediment “ways of dealing with,” as well as how the conflicts these technologies helped to shape are ultimately erased in the process of stabilization.

Mining as a Philosophical and Collective Endeavor

The technological, economic, and social system constituted by the Harz mining complex rested on a weak and hard-to-attain equilibrium that required the participation of financial investors, manpower, water resources, and water pumps. This ecological structure was pivotal in defining not only what counted as essential knowledge, but also the ways in which specific knowledge about the Earth could only be attained by chunking information together from a diversity of fields and experiences.

Mining in Nueva España faced the same weaknesses as in Germany: a shortage of manpower, differing rule sets, shortages or excesses of water, and difficulties in dealing with specialized workers. However, mining in Nueva España was deployed in the midst of the eighteenth-century social unrest and uncertainty. Authors such as Brading (1971) have argued that the enormous success of Spanish colonial mining during the eighteenth century was due to organizational and technological improvements.

From my perspective, the process was much more complex and by no means a direct result of the set of measures taken by the *visitador* José de Gálvez Gallardo (1720–1787) between 1765 and 1771.⁸ Opening mines in the fringes of the northern territories of Nueva España was a strategy of colonization that lured

cence” deserves greater attentions on the part of the scholars who work on the consequences of the Anthropocene.

⁸For a detailed overview of Gálvez’s accomplishments and failures during this period, see Navarro García (1964).

new settlers and, thus, created minimal conditions for stable border villages and military posts. Prospecting was crucial to these ends. But, of course, neither the geology nor the political sociology of the colony was homogeneous. It was difficult to predict when and whether the strategy would succeed. Moreover, it was difficult to make law an instrument for enforcing stability in mining without a previous basis upon which to assess (in economic and epistemic terms) what a proper, profitable, and sustainable mine would look like. Focusing on the lode led to a particular way of understanding the inner structure of the Earth and how to profit from it, a way tied in with the specific practices of abstracting and contextualizing information.

Different narratives traversed mines, requiring the unfolding and projection of different notions of time and space, position and direction, structure and content. This was partially attained through illustrations by means of a long-standing tradition of biblical accounts of Divine Creation (Magruder 2009). Many eighteenth-century miners would have probably been more or less familiar with some of these accounts and depictions of the Earth's structure. At the end of the seventeenth century, as mentioned above, philosophers successfully transformed mines into laboratories and located their notions of the natural history of the Earth on more empirical grounds (Hamm 1997). But this empirical approach ran parallel to the production of new and more conceptual strategies for ordering and circulating data. Thus, Rudwick (1976) has shown in his seminal work that visual information in the geological field evolved, influenced by technological and economic constraints, into more abstract and conceptual forms that printing could spread widely.

A common visual language, however, depends not only on the circulation of printed materials; commonality also emerges from the consolidation of visual requirements in strategic fields alien to the disciplinary corpus. Rudwick stressed that the geological map evolved gradually, and that the first steps of the process took place in social contexts with utilitarian goals like mining and surveys (Rudwick 1976, 159–160). But when he looked around to identify the practical and cognitive tradition that paved the way for the epistemic framework that supported attempts to put three-dimensional information in a plane, he paid little attention to manuscript maps. Halfway between geological maps and geological sections, manuscript mine maps provide a less structured starting point. They offer a more collective approach and maybe a less linear narrative. This is, in part, because they were understood as the result of a common matrix of problems and a common language, and intended to circulate in a range of spaces of discussion. Figuring out the underlying structure of the Earth was, of course, a collective endeavor in many ways.

A surveyor and drainer, William Smith (1769–1839) based his stratigraphic principles on a transversal section drawn by the miner John Strachey (1671–1743) and published them in 1719 in the *Philosophical Transactions* of the Royal Society (Strachey 1719). Strachey’s work was deeply connected to the industrial development of Somersetshire (Fuller 1969). Relying on collective memory and knowledge made possible the production of a sophisticated connection between the position and the direction of veins as that provided by Strachey.⁹ His now-famous engraving of the coal mines of Mendip (Fig. 9.1), allegedly the first that represented the mineral strata, is a wonderful example of the kind of knowledge a miner had in those days and lands,¹⁰ and of how the visual display of all that information provided both explanations and prescriptive rules for imagining and managing (a small portion of) the inside of the Earth.¹¹ Moreover, his account and explanation of the order in which coal veins were regularly found in a defined area showed how collective knowledge made it possible to transform local knowledge into more general knowledge.

Collective knowledge also provided the basis for Lehmann’s study on the stratigraphy of mountains.¹² To describe the regular disposition of the geological layers in different—but fairly close—areas, Lehmann trusted the narratives of mining workers, whom he acknowledged as the authors of important discoveries, the source of innumerable questions (Lehmann 1759, 5), and the creators of a specialized and rich vocabulary to refer to the structure of mines and the contents of the earth (Lehmann 1759, 308ss).

⁹Strachey explicitly recognizes that his account is based on other colleagues’ knowledge, and that both mining and oral record were the source of any valuable evidence, when he states that “some say there is also another [type of vein] under the last [of the listed kind of veins in the picture], but that has not been proved in Man’s Memory” or “At Farrington they have the same veins, which, as I am informed, agree in all parts with those of Bishop-Sutton.”

¹⁰Among other things, the core of this knowledge was related to the orientation and slope of the vein, the depth and distance between coal veins, and the regularity of the disposition of the successive layers of veins. Of course, this was also an abstraction that corresponded to a particular kind of soil, and one that did not fit every territory equally, especially when the mining development was in a mountain.

¹¹This is clear when Strachey compares the depth at which two mines at different places found a specific vein: “But as in fact there are dug near the same depth, it follows there must be a Trap, or several Traps down.” As the picture shows, Strachey conceived these traps as the result of “a Ridge which breaks the Veyns and make them trap down.” On the theoretical assumptions and the links behind this kind of engineering style of representing strata, see Rudwick (1976, 168–169).

¹²Lehmann advanced the law of superposition in his 1756 book *Versuch einer Geschichte von Flötz-Gebürgen* [Essay on a history of the stratified mountains]; it was offered to French-speaking readers three years later as the third tome of a collection of works translated by Baron D’Holbach under the general title *Traité de physique, d’histoire naturelle, de minéralogie et de métallurgie, under the specific title Essai d’une histoire naturelle de couches de la Terre, dans lequel on traite de leur formation, de leur situation, des minéraux, des métaux et des fossiles qu’elles contiennent*. Paris: Jean-Thomas Hérissant (1759). I quote the French edition.

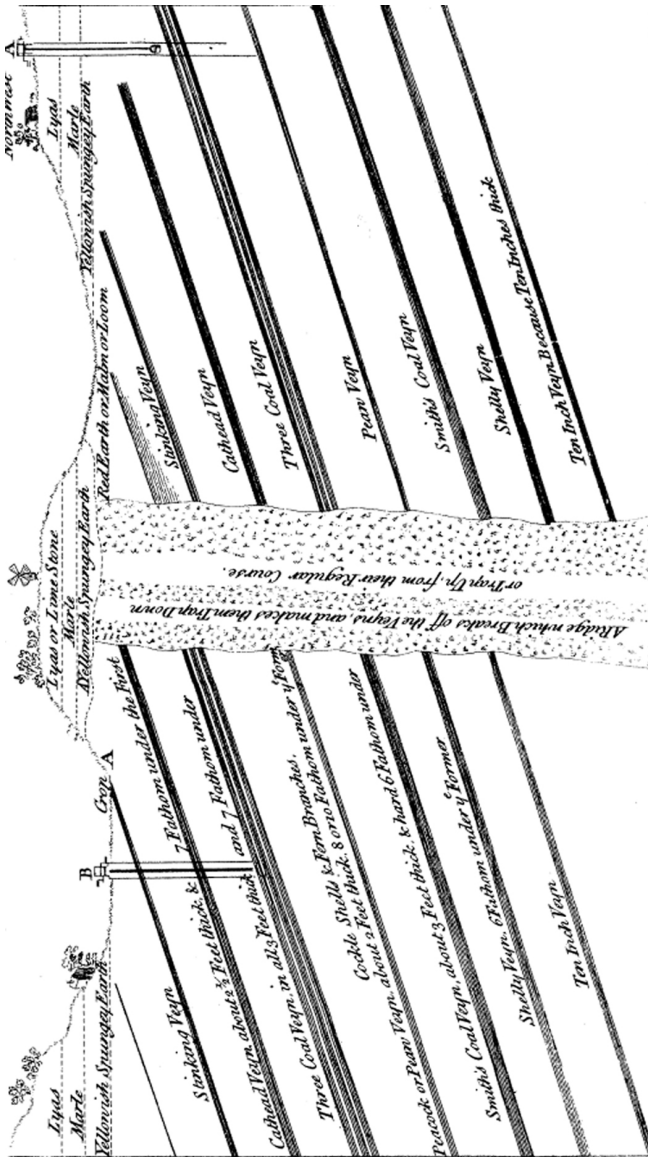


Figure 9.1: John Strachey engraving of the coal mines of Mendip (1719).

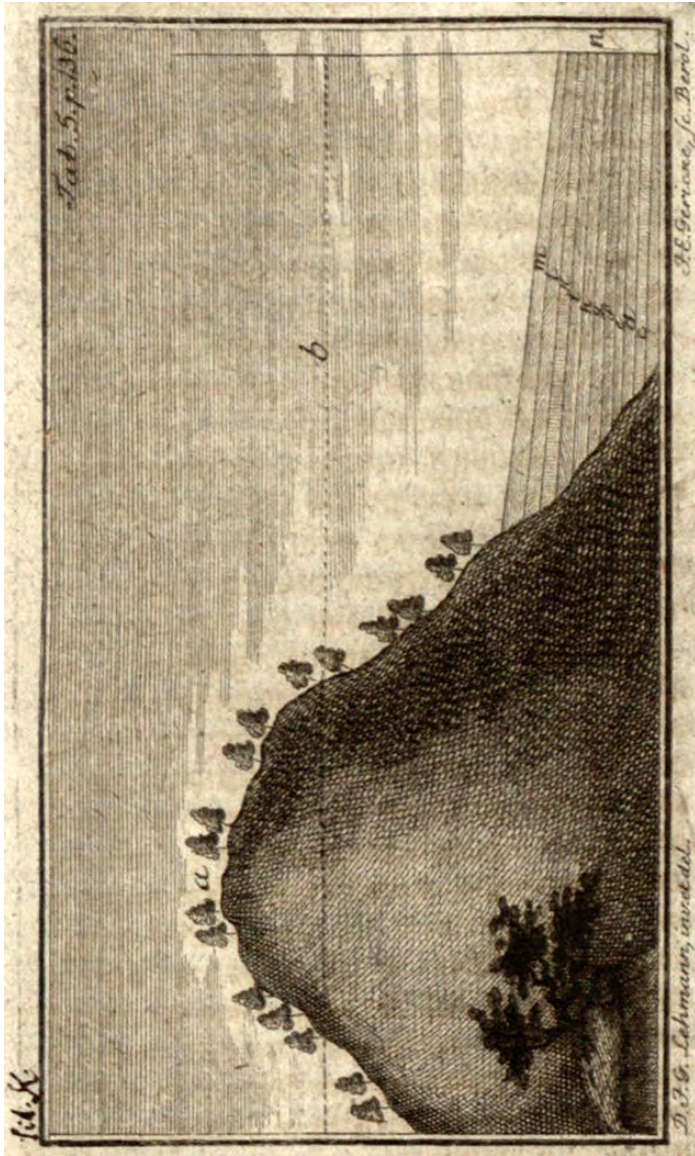


Figure 9.2: *a*, primitive mountain; *b*, level of waters after the Deluge; *c*, *d*, *e*, *f*, *g*, *h*, *i*, *k*, *l*, *m*, layers or strata caused by slowly sedimentation. (Lehmann, *Versuch einer Geschichte von Flöz-Gebürgen*. Berlin, 1756, 136. Universitätsbibliothek Heidelberg. (<http://digi.ub.uni-heidelberg.de/diglit/lehmann1756/0223>).

It was due to their experience that we recognized the different geometries that distinguish the mines of primitive mountains—characterized by veins [*filons*], that is, perpendicular (or *inclinés à l'horizon*) strata (Lehmann 1759, 233–234)—from those of a secondary, post-deluge stage—layered mines, horizontal strata (Fig. 9.2).¹³

The works by Strachey, Smith and Lehman exemplify the extent to which producing these geometries was a collective endeavor, and so they help us to understand how political, orographic, and utilitarian constrictions also instilled epistemic values that fostered and oriented the emergence of these underground geometries. However, we still need many more insights into the connections between the practical endeavor of mining and the increasing complexity of mining maps as tools for ordering and producing the mine environment.

To consider this, it is worth exploring the different (visual) narratives which preoccupied mines and miners in Nueva España during the century that separates Strachey's work from Smith's. Many of the eighteenth-century Nueva España mining maps were produced as part of the legal file of the mine; that is, to register it as a property or resolve some litigation that threatened ownership. They were produced by *maestros*, practitioners and surveyors with very different backgrounds, but who faced similar problems as regarded the function they attributed to the representation and the structure of the mine and, in some cases, of the soil, as they imagined it to be. Analyzing them will help us understand the role of *peritos* (mining experts) and surveyors and changes in how they conceived and depicted the mountains' innards.¹⁴

Three factors determined the evolution of these maps: the growth of the mines, local regulation on mining, and the custom of solving disputes about property in the courts which made it necessary to understand the structure of the veins to overcome legal and economic challenges. Although the law that ruled mining exploitations in the Spanish colonies was general, local variations proved important to the evolution of these maps. In Peru, miners were forced to stop their development as soon as they reached the boundaries of a mine owned by another miner or company, but miners in Nueva España could pursue a vein as far as they were able, even if they entered another mine, provided that they would give a

¹³See Lehmann (1759, 218): “Si je descends dans une gallerie de mine à filons, practiquée dans le sein d’une montagne, souvent sur une longueur de 100 toises, elle aura 20, 30 & même 40 toises de perpendiculaire, au lieu qu’une gallerie pareillement de 100 toises, faite sur des mines que sont par couches ou par lits, tels qu’on trouve ordinairement les charbons de terre, les ardoises, & c-aura à peine 10, 12, 15 ou 20 toises de perpendiculaire. Ainsi les mines de cette dernière espèce ont communément une pente plus douce, au lieu que les mines para filons ont une pente plus roide.”

¹⁴For a completely different approach to the one developed in this paper, see Aguilar-Robledo (2009) where the author analyzes the theoretical backwardness of Nueva España surveying during this period due to financial factors and a lack of regular mathematical training.

share to the owner.¹⁵ This implies that, in cases of contention, the owners had to show they were pursuing the main vein of their property and that they knew the kinds of connections among the several veins. In most cases, they also had to demonstrate awareness of water resources and that they were not consuming the water needed for the nearest villages to survive

Since the early times of the Spanish invasion, mines were depicted basically as sketches to visualize not just the position of a mine but also the shared resources and common goods (roads, rivers, etc.) that surrounded it, as well as the kind and number of settlements nearby (that could be affected by it). Thus, a mine's juridical and economical natures were captured at first sight. However, because of this juridical nature, how location was established and the accuracy of position became crucial—hence the importance of who did the measuring and how it was done. In the process, the challenges of measuring and depicting became a sign of the seriousness of the trade; at the same time, the series of things that entered the map in connection with the mine were increasingly marked by economical and/or strategic importance. These *maestros* longed, in visual terms, for an abstraction closely related (even with three-dimensional information) to the local place—just as Leibniz did when he imagined transparent models of the mountains. In the long run, I will argue, these challenges would shape the epistemological approach to the mining development as a complex system, mainly by selecting and highlighting the kind of knowledge that was considered useful and worth depicting in different circumstances.

Competing Grounds: Money and Mining in Nueva España

The insides of high mountains were rather unarticulated spaces during most of the eighteenth century, in at least two ways. First, they played the role of primeval spaces, *topos*, in relation to which the structure of more neatly organized spaces could be explained. This was the role they played in Lehmann's work, which linked the production of stratigraphic order to the production of heterogeneous content, signaling a historical path in which the constant action of Nature transformed simple structures into composed ones; thus, while allowing the persistence of ordered strata, it increased the complexity of the system. By approaching the history of the Earth from the point of view of its increasing heterogeneity, Lehmann had to identify the beginning of his historical series, that is, the "primitive" spaces where homogeneity could be proven. These spaces were the highest mountains,¹⁶ the comparative term for evaluating variability.

¹⁵See Gamboa (1761, 213, 300). Other differences between the rules of the two colonies on p. 204.

¹⁶See Lehmann (1759, 104, and section III, 235ss).

Second, as we shall see, for most of the miners of Nueva España, a mountain was internally undetermined. They had no expectations about a stable and recurrent structure in it and no narratives about the function of its layers; and giving it an inner structure was not an intentional aim but the result of the increasing need for deploying specific geometry. Geometries sustained different notions of possession, commonality, natural history, prospecting, and foresight and paved the way for different presents and futures.

Before discussing the changes undergone by these geometries and the consequences of these changes, let us first approach the question of the many knowledges, practices and interests behind the claimed geometrization of the underground mines.

During the eighteenth century, the Viceroyalty of Nueva España increased the number of mines in all of its dependencies (see Fig. 9.3). Besides the traditional zones, such as Guanajuato, Pachuca, and San Luis de Potosí, new mining exploitations emerged in the newly conquered territories of Durango and Chihuahua starting in the early 1700s and in Sinaloa in the last third of the 1700s (Mendizábal 1980, 56). Mining exploration was part of the strategy of colonization, since the promises of wealth attracted people who would help create stable settlements. Success in establishing these settlements was uneven. Most were quite ephemeral since they were initially composed of a floating work force, many of whom were *catadores* (vein-seekers) in search of an opportunity for real business and specialized workers who would move as soon as they heard of a richer vein where they could earn a better living.

Typically the *minero*, or owner of the mine, was formerly a *catador* and often was also a miner lucky enough to discover a vein. This was the first step to becoming an owner, although the chance of doing so, despite the intended equanimity of the law,¹⁷ depended on the availability of capital to invest in the venture. Such capital was almost nil in the case of Amerindians, who almost immediately had to sell a new mine to a wealthier proprietor. Hence, for many *indios*, the discovery of a mine was an opportunity not for a sudden and dramatic change in social status but for a substantial improvement in their economic well-being.

Of course, the law protected the rights of those who truly endeavored to discover new mines since exploitation implied great profits for the crown. But these entrepreneurs had to deal with rogues who pretended to have discovered a vein just to claim the profits of their neighbor. Besides, there were important rewards for whomever was registered as the first discoverer of a mine. So the *catador* had to have certain knowledge and manage his scarce resources adequately *before* venturing to register a vein.

¹⁷See Gamboa (1761, 23–24).

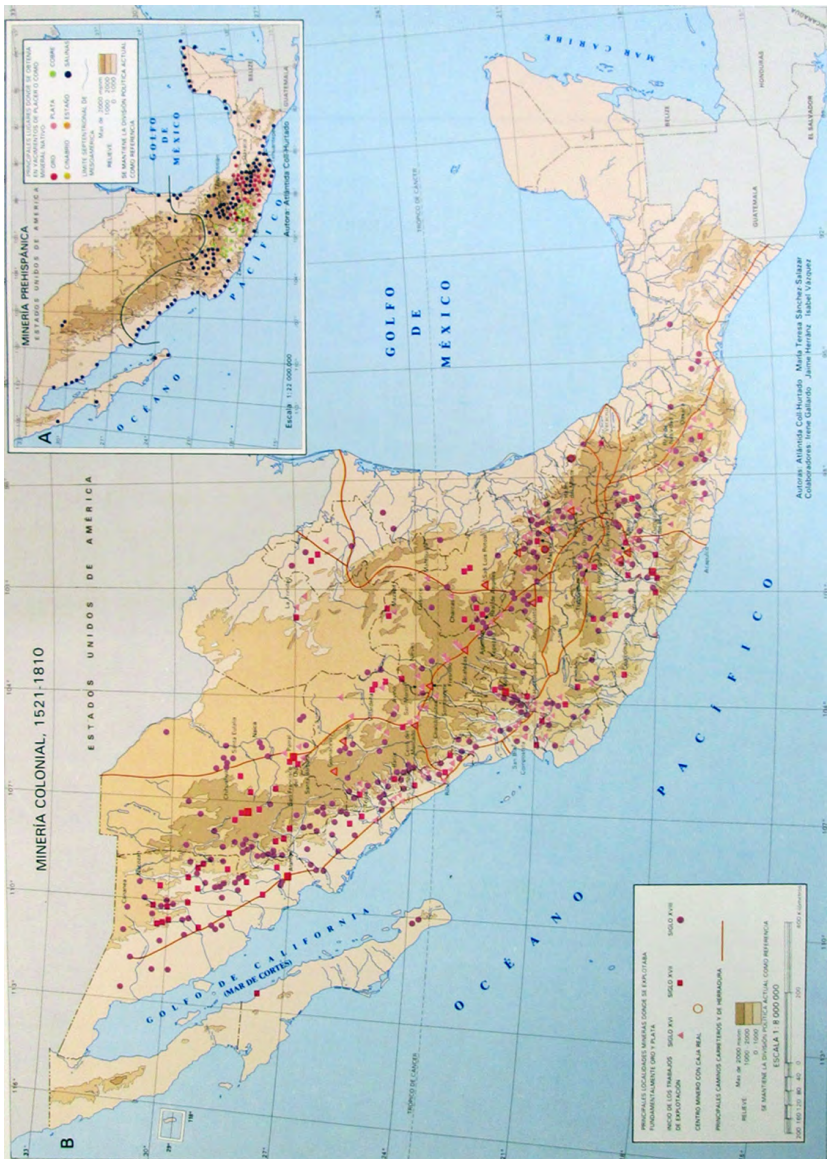


Figure 9.3: Map of the Mexican mines during the Spanish Empire by Atlántida Coll-Hurtado (UNAM-IIG, 1990). Round dots indicate eighteenth-century mines. (Courtesy of the UAM-Cuajimalpa Library.)

The first thing he had to know about was, of course, minerals. He was supposed to know how they looked, how to identify whether a vein would be a rich one, and whether the minerals were going to be more or less pure. For the miners, especially the *barreteros* (blast-hole experts), this knowledge was financially crucial since they were paid in kind (as a privilege),¹⁸ and when the purity of the metal fell or it became scarce, they migrated to other mines.

Rules about mining recognized all these capabilities, and they were able to ensure a kind of fairness by designing a fine-grained protocol and geometry that transformed conjectures and signs into proofs and ontologies. Thus, the first thing a mine discoverer had to bring to the register in Nueva España was a sample of the mineral with clear directions about where it had been found. The *catadores* also had to dig at least three *estados*¹⁹ to prove that they really intended to exploit a new mine, that there was a vein, and that they were not just pretending to have found one (Gamboa 1761, 103, 105, 125). But, of course, landscape and geological features of the terrain imposed differences in ways of living and hence in the ways knowledge was used, exchanged, negotiated, and transferred.

Since the orography was very rocky and rough in some places, such as Zacatecas and Chihuahua, and some of the northern territories were sparsely occupied, it was usually Amerindians who provided—by means of missionaries and priests—the first news about a vein in those fields (Mendizábal 1980, 43). These people did not become owners of a mine nor were they forced to work in it, but they had many ways of making a living from mining. As far as we know, a good number of *buscones* occupied abandoned mines until they emptied most of them. But this was not a planned activity that could be projected upon the future as a rationalized industry. Native miners in the North hollowed the insides of the Earth with an apparent sense of contingency that did not leave much room for thinking about structural continuities, fostering an ephemeral economy.²⁰ On the other hand, experienced and wealthy miners such as Juan Lucas de Lassaga could plainly deduct from the richness of these scattered mines, discovered and developed by “few men, without knowledge and without resources” (Lassaga and León 1979 [1774], 15), that the northwestern part of the Viceroyalty, a strip that went from the border between Nueva Galicia and Nueva España to the Presidio de Fronteras—a parallelogram 300 miles long and 80 miles wide—was a single bed or deposit. He also said that the richness and discontinuity of the *placeres de*

¹⁸Mine owners were aware of the advantages that *barreteros* took of their knowledge and, in some cases, they tried to instruct unskilled workers in this trade who would not ask to be paid in kind, von Mentz (1998, 39).

¹⁹An *estado* was a measure equivalent to the average man’s height.

²⁰See, for example, Dahlgren (1887, 218) about the Lomo de Toro mines, where—“as happened in many mines after the Independence”—native miners looking for short-term profit and working without a system literally hollowed the mine, destroying pillars and causing its collapse.

oro (gold deposits) were due to the effects of the Deluge, since they were “ancient relics of the destruction and collapse of the mountains” caused by it. Since they were no more than vestiges, cautioned Lassaga, miners should not expect to find inexhaustible, long-standing gold exploitations because “they are not [proper] veins, so the ore can not reproduce in them.” By contrast, silver veins were sustainable since the elements of silver were diluted by water and then carried by it to the vein again (Lassaga and León 1979 [1774], 9); moreover, the deeper the mine went, the greater the quantity and purity of mineral.²¹ This geological and orographic profile had several consequences. On the one hand, it seemed to support the optimistic financial expectations for investing in the draining of flooded mines. On the other hand, the scattered pattern of the northern mines, and their distance from the administrative centers, caused social unrest and security problems affecting the circulation of currency (Sáenz Carrete 1999, 54).

In central Mexico, things were slightly different. In this area, the rights guaranteed to the Amerindians clashed with a pressing need for manpower. As the pressure increased from the 1720s on, social unrest also increased, and demonstrations against the forced draft of Amerindias to work in the mines are recorded in Tepoztlán and Pachuca-Real del Monte (von Mentz 1998, 26–27). After the expulsion of the Jesuits from the Spanish territories, social unrest worsened and working conditions also became harsher.²² Moreover, the cost of drilling increased, since most of the mines needed to be drained and different solutions were worked out to cut expenses. Thus, whereas the proportion of skilled workers (*barreteros* and *cuñeros* o *picadores*) and unskilled ones inside the mines was 60% to 40%, respectively, mine owners such as Romero de Terreros in the Pachuca-Real del Monte area tried to train the unskilled to do the job of skilled workers and thus increased the number of unskilled workers to the detriment of the skilled ones (von Mentz 1998, 39; Navarrete Gómez 1998, 104). Knowledge, costs, and conflict went hand in hand. This pattern of rationalization of mining management also reinforced the emergence of the administrator as the mining expert in

²¹Miners did not believe in the law of diminishing returns precisely because economic prospects depended on geological knowledge. See, for example, Lassaga and León (1979 [1774], 9): “¿por qué no han de esperarse metales de crecidas leyes en las labores hondas y principales, encontrándose casi en la superficie, y siendo un axioma inconcuso en la Minería, que estos preciosos frutos se crian con maior madurez, y abundancia á una justa profundidad? Podría decirse, que los metales de las labores altas son provechosos, porque no reportan el crecido costo del desagüe; pero tampoco se sacan de tan buena ley, y en tanta copia, como de las labores profundas. En esto hai (sic) una diferencia mui grande, como prueba la experiencia, y aun sin ella persuade la razon.”

²²von Mentz (1998, 27). In Nueva Vizcaya (Chihuahua, Durango) several missions were transferred to the secular clergy, which implied the incorporation of Amerindians into mining work, Sáenz Carrete (1999, 55–56).

high-profit mines, replacing the owner in controlling and designing the paths and practices that shaped the mine.²³

Conflict most often extended to the underground in these regions, for there were more mines closer to each other in a less than stable territory. But, whereas proximity was the occasion for intermingling and legal intervention, it also fostered an increasing interest in the way veins “behaved.” The challenges in giving an appropriate, clear and complete representation of the path and connections between veins and mines, inherently linked to moral and financial concerns and costs, led to conceptualizing the galleries and tunnels as visualizing instruments.²⁴

This conflictual approach came from both cost calculations and geological understanding and produced (and was in fact immersed in) a logic of classification and hierarchical organization. It is no surprise, then, that the analytical form most used for thinking of (or visualizing) mines was that of the tree, as we shall see. Not only Gamboa, but also Lassaga and Velázquez would claim this as the appropriate way of understanding geological and mineralogical activity:

[In the mountains] Nature created one or many metalliferous veins thick and fertile, from which, as from the trunk of a tree, usually branched many others, finer ones, often called fibres, that intersect and interweave in many ways.²⁵

But, of course, mines should not be considered just from the point of view of thickness and form, but also from the point of view of justice, that is, slope. From the early 1730s, there are testimonies to miners’ discontent with the rule that imposed the same way of measuring a mine with a vertical vein, that is a *filon*, and one with a horizontal vein. We shall see how these miners’ position evolved from claiming the right to exploit the slope as it was infinite to arguing that the proper measure of a mine should be in relation to the angle from the vertical and the lateral slopes. This was not just an economic rationale, but a trigonometric one.

The Law of Veins: Description/Structure and Environment

In these circumstances, not only mines but maps of mines became more frequent during the eighteenth century in Nueva España. Complaints about the need for

²³See the case of Juan Bars in La Vizcaína, Real del Monte, in Navarrete Gómez (1998, 104).

²⁴See Gamboa (1761, 200), who stressed the utility of pits for revealing the slope of the mine.

²⁵Lassaga and León (1979 [1774], 3). Lassaga and Velázquez considered loose or independent veins, those that did not fit the tree-form, to be abnormal and ill-constituted (*peregrinas y mal constituidas*), Lassaga and León (1979 [1774], 12).

more accurate maps of mines were recurrent during the second half of the century.²⁶ These complaints were the result of the progressive spread of a geometrical reasoning which was partly a response to legal requirements and partly an expression of a geological imagination. A chronological analysis of some of the maps and drawings done between the end of the seventeenth century and the end of the eighteenth, all of them at the National Archives of México, provides a glimpse of the kinds of problems miners, owners, and surveyors faced in Nueva España in defining the shape, extent, and inner structure of mines, and how they dealt with them.

As the drawing of the mines of San Nicolás, San Luis, San Diego, San Bartolomé, and Santa Clara y las Ánimas (1669) shows, during the late seventeenth century, the space occupied by the mines was at the same time idealized and hierarchical: A linear succession of mines connected along the same vein (though mining probably went on at different levels) drawn from a bird's-eye view, stresses the size and the relative position of each (Fig. 9.4).

This was a perfect approach for imaging the orientation and disposition of the mines in the territory, but quite uninformative about the connections between mines. By 1735, the position of the entrances of the mines and the directions and length of the main galleries indicated a more detailed way of looking at the system comprised of a couple of mines. The mine of San Antonio in the Cerro Garibaldi (Santa Fe de Guanajuato, 1735) (Fig. 9.5), depicted and measured by Francisco González Castañeda y Alvarado, is a perfect example.²⁷ González Castañeda was a *medidor* (surveyor) and supposedly knew the regulations and rules for measuring a mine. The normal procedure always began by identifying the *estaca fija*. The *estaca* was the fixed reference from which the mine's surface was calculated according to the law. He did not register it in the map, but he put information at the places where the *catas* (exploratory dig) had been done. He measured the mine from its main entrance along its whole path and displayed the measures of the 10 sections of the mine from a bird's-eye view.

Hence, his map lacks the frame that would endow it with sound legal meaning, but we can find that frame in other maps, such as the one for the Cabrera and San Antonio mines (Santa Fe de Guanajuato, 1748).²⁸

²⁶See, for example, Gamboa (1761, prologue w/p, 231) and Lassaga and León (1979 [1774], 28). Aguilar-Robledo (2009) analyzes these complaints in connection to surveying. He stresses the high costs of surveying, which explains the lack of expertise in rural areas.

²⁷“Mapa de la [minas de San Antonio] de el zerro degaribaldo, hasta elde el caliche, echo por Dⁿ Franco Gonz^l Castañeda y Alvarado; condeclarazⁿ q las V^s que ai de una Mina aotra son nobezientas binte icinco y media, segun yenlaforma q consta ensu declarazn.”

²⁸See Map of the Mines of Cabrera and San Antonio, Santa Fee, Royal Mines of Guanajuato, 1748 (AGN); on this mine see Gamboa (1761, 297). Also see Map of the Mine of San Cayetano, Sultepec, Edo. Mexico, 1783 (Fig. 9.14).



Figure 9.4: Map of the Mines of San Nicolás, San Luis, San Diego, San Bartolomé, Santa Clara and Las Ánimas, Hidalgo, 1669. (Archivo General de la Nación, México. Mapas, planos e ilustraciones, 2247.)

Both maps, however, clearly display the mines as something without depth and as plain as roads on the surface. This way of depicting mines had an advantage of showing the intentions of the miner in the case of litigation. If the path was somehow erratic or difficult, it was clear that he was pursuing the track of the vein according to the law, but if the path was too straight in the direction of a second mine that was exploiting a rich vein, then it was clear that the first mine was

copying a previous map, but asking witnesses for the previous measurements about the starting point of the surveying, and then translating or “reconstructing” the measurement—out of the testimonies and available data—into the new map.



Figure 9.6: San Antonio de Zimapán Mine, Zimapán, Hidalgo, 1751. (Archivo General de la Nación, México. Mapas, planos e ilustraciones, 1451.)

In this case, the measurements—done by the *medidor* Ildephonso Iniesta Vejarano—began in the *estaca fija* (numbered 1 on the map), as opposed to former measurements: in 1744 it began at the entrance of the mine, or (the memories of the witnesses at the time of the first measurement differ in this point) at the rocks signaled with the number 4. This was also a surface measurement. Iniesta, as *medidor* and witness, apparently wanted to stress this circumstance by describing and depicting the position of the most noticeable landmarks “as [he] saw them in the field.” Consequently, Iniesta’s map mixed geometric and naturalistic styles of mapping, thus connecting the underground geometries with the surface environment.

A few years later, the inner structure of the mines became the focus of pictographic descriptions in a more decisive way. This kind of description could be

more or less integrated with the environment. Thus, it could visually refer just to the geographical orientation of the mining complex, while providing textual indications of its depth in each branch or mine, and also a minute report about the wide and geological features of the vein in each case and about the general environmental conditions²⁹ (Fig. 9.8, 9.7); or, on the contrary, show a more complex visual arrangement to define visually the underground position of the mines as well as their relative positions to the surface surroundings and the underground veins (Fig. 9.9, 9.10, 9.11).³⁰ Shortly after these maps were drawn, the lawyer Francisco Javier de Gamboa (1717–1794) published his *Comentarios a las Ordenanzas de Minas* (Commentary on the Law of Mines) in 1761. In this text, he complained bitterly about the lack of skill and of scientific knowledge among the *medidores* or *prácticos* and about the fact that mines were rarely measured on the inside.³¹ At the time, mine measurement was still not a standardized practice: One of Gamboa's aims was to spread the methods described in the famous manuscript on measurement of water, lands, and mines by Joseph Saenz de Escobar, whose first version dates from 1700, and the last from around 1749.³² But Gamboa's obsession with measurement should not obscure the aims of these maps: First, to order the space, unveiling structures, arborescent dependence between the branches, and the different degrees of profitability expected in each of them, and, second, to produce a sense of unity by describing the mine as a complex yet practicable enterprise.

Despite the apparent modesty shown by the authors, the two maps mentioned above display an amazing degree of information and knowledge. Drawn by the *peritos* or *prácticos* Joseph Joaquín Barsola and Pedro Martínez, and by a *medidor*, Felipe de Zuñiga y Ontiveros, respectively, they reflect different back-

²⁹Mina de San José (aka La Boladora), Sierra de San Antonio de la Iguana, Nuevo León (1758). This information appears in the text of the map (Fig. 9.9). Regarding the environmental conditions, it reads: "This mine drills down a lode that runs from East to West with a slope towards the North by the side of a hill or high Mountain called San Antonio de la Iguana, halfway its path from the summit to the base of mountain, which ends in a ravine where other mountains not so high start, and seemingly also other mineral deposits, [at this point, i. e. halfway] there is no woods, and nothing except underbrush: the above mentioned vein is embedded in the rock in some parts, and it softens in other parts, but all along it is sheathed with a blue stone or slate in both sides. At the base of the mountain, and within five leagues around, there is no stream or river; there are only, not very far away, some half-drained, little eyes of water [oxitos de agua cortos], that run totally dry during the dry season, according to those experienced and that have longtime knowledge of the place; right now these eyes only can be used for the survival of people." (author's translation).

³⁰Real de San Antonio de las Cañas, Zimapan, Hidalgo (1759).

³¹See Gamboa (1761, prólogo, 206, 231).

³²There were at least nine drafts of this manuscript. The original is lost, but seven copies—with great differences between them, dated between 1706 and 1749—are nowadays localized and preserved. The most detailed work about the history of the manuscript and its successive copies is Nickel (2000). See also Aguilar-Robledo (2009, 34 note 19).

grounds and epistemic styles. The first map is more focused on how the vein becomes more or less rich. But it also describes the mine, taking as a point of departure its main entrance (letter A in figure 9.8), situated midway on the hill, a point at which a very rich sample of ore was found. From here, the mine forked into two main galleries. One is called Santísimo Sacramento and ran northwest following the lode five *varas*³³ deep, where two kinds of high-quality ore were found as represented in the map by the segments ABEG. The second, Nuestra Señora del Pilar, represented by AHI, ran towards the west, one and a half *varas* deep, with a great deal of ordinary ore. The gallery HJ went three *varas* upwards towards the West.

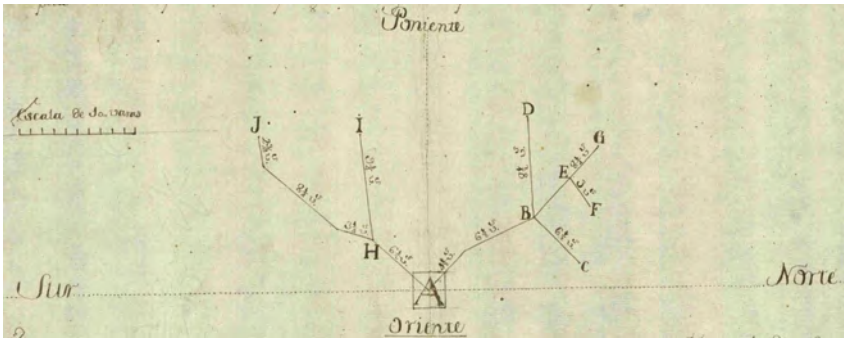


Figure 9.7: San José (La Boladora) Mine (detail).

The Santísimo Sacramento, in turn, had three branches: BC (one *vara* deep) and EF, which was on the same level as ABEG, ran northeast and was rather rich. Another, BD (also on the same level as the main gallery), went west and the vein became *emborrascada*, that is, petered out at BD's end. With all this information, readers could deduce that the vein had a lateral inclination towards the north—a datum that the author already gave in the legend of the map—and would even be able to calculate it. They could also foresee—to some extent, at least—what the most profitable path for drilling this mine could possibly be, since the connection, direction, hierarchies and intersections were all clear. But all this three-dimensional information was not manifested graphically.

³³A *vara* is approximately 0.860 meters, and a yard 0.914 meters.

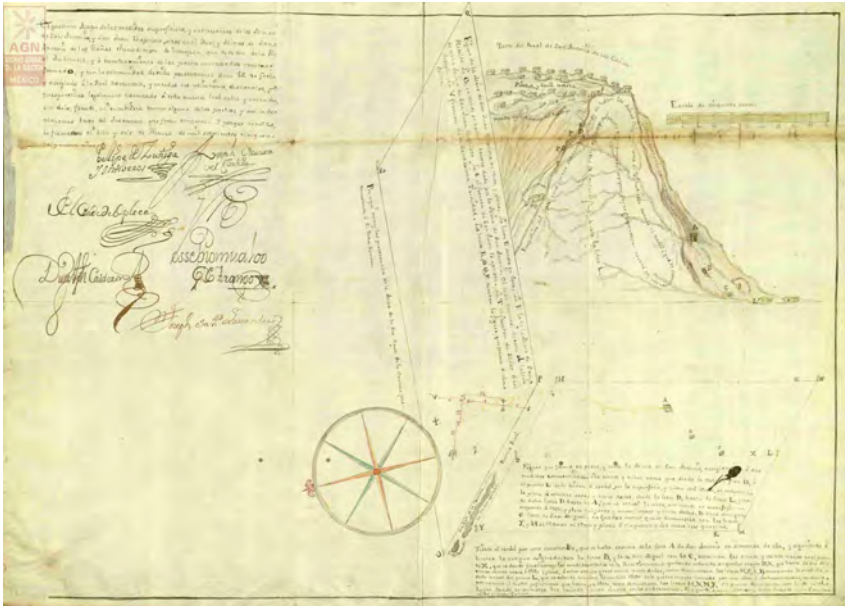


Figure 9.9: Royal Mines of San Antonio de las Cañas, Zimapán, Hidalgo, 1759. (Archivo General de la Nación, México. Mapas, planos e ilustraciones, 4162.)

Giving the tree-like structure a three-dimensional view was the aim of the second map. It is an amazing effort to make visible how one mine (San Antonio) grew upwards, pursuing the vein, until it entered another one (San Juan Bautista). The map depicts the whole social and natural environment of the mine. In a second plane, the mountain appears. At the top of the mountain, there is a partial view of the hamlet of Real de San Antonio de las Cañas, with its main street and square, and the path that seemingly went from Real to the mines. The mountain appears sectioned. The section was done as if by taking two points in the same plane, D and L, which had been measured with a string, in such a way that the mountain was cut with a string until the cord stood perpendicular to D (which is the *estaca fija* of San Antonio). This last axis is signaled by a dotted line. The same axis is part of the other lateral section, which apparently makes an angle. The section of the mountains shows the inner arborescent veins and every relevant architectural and orographic detail.

In the foreground, there is a still more abstract depiction of the relative position and connections of the underground galleries. The mountain is transparent here, and the space of representation is defined by two planes: one horizontal

plane that results from the perpendicular projection of the surface measurements of San Antonio on a plane at the base of the mountain (A being the entrance to the mine), the other plane being vertical, making a right angle at the left; it represents the left section of the background mountain as defined by the dotted line from D to the base. The traces in red represent the galleries of the San Juan Bautista mine, while G is the point at which San Antonio (green line) meets San Juan Bautista. The ideal point of view for looking at the whole mining system is a high angle. But only when the background mountain is considered do we realize that San Antonio had pursued the vein upwards until finding San Juan Bautista, which was also pursuing the vein upwards. In this case, San Antonio's owner had considered the vein as infinite, whereas the projection showed that he had far exceeded the legal terms of his property, which shrank dramatically when reduced to a plane. Not surprisingly, in 1774, Lassaga and Velázquez complained about the advantages of those miners who exploited a perpendicular vein over those who worked on one that ran inclined, claiming that the legal measures of a mine should be set once its slope was known.³⁴

Even if both maps have obvious differences, they use the same cognitive strategy: both the conflictual meeting of the mines and the distribution of the minerals are presented as a consequence of a "natural" treelike structure; parts and dependences will always be well defined, but the shape would not be identical to any other. This produced additional consequences, as, in both cases, the singularity of the conflict and the distribution of the ore strengthened the impression that visual description helped to increase local understanding, but by no means did it allow for generalizations or, more precisely, support generalized expectations.³⁵

Both maps acted as an epistemic instrument that helped to establish the elements that composed the unity of the description of the mine. In the second map, the attachment of the structure of the mine to the orography of the place and the surface environment unveils a change in the conception of the unity of description. We have a good example of how much this trend had evolved in the map of the Royal Mines of Tlalpujahua (Michoacan), by two *peritos*, Miguel Ángel Flores and Joaquín Castelaz in 1773 (Fig. 9.12).

³⁴They also explained that if the mine has a slope of more than 45°, then the legal property of it would end before the miner was able to reach the depth at which the vein would be more fertile. See Lassaga and León (1979 [1774], 28).

³⁵See, for example, Gamboa (1761, 200–201): "considerada mas profundamente la calidad de las Vetas, se advierte la grande diversidad que ay (sic) entre ellas: por lo que unas no pueden servir de exemplo ò regla para discurrir la situacion, y curso de las otras. Y aunque esta materia toca à los Physicos, que han especulado, y observado los arcanos del Mundo subterraneo, y es de dificil comprehnsion, estando encerrada en las entrañas ocultas de la tierra; es muy propio de nuestro assunto decir las diferencias, diversos gyros, y progression de las Venas, experimentada por los Professores, y Prácticos; como que de esta misma diversidad se conoce la justificación de tomar las medidas de las Minas por todos los rumbos que se discurran mas favorables al fin: [...]."

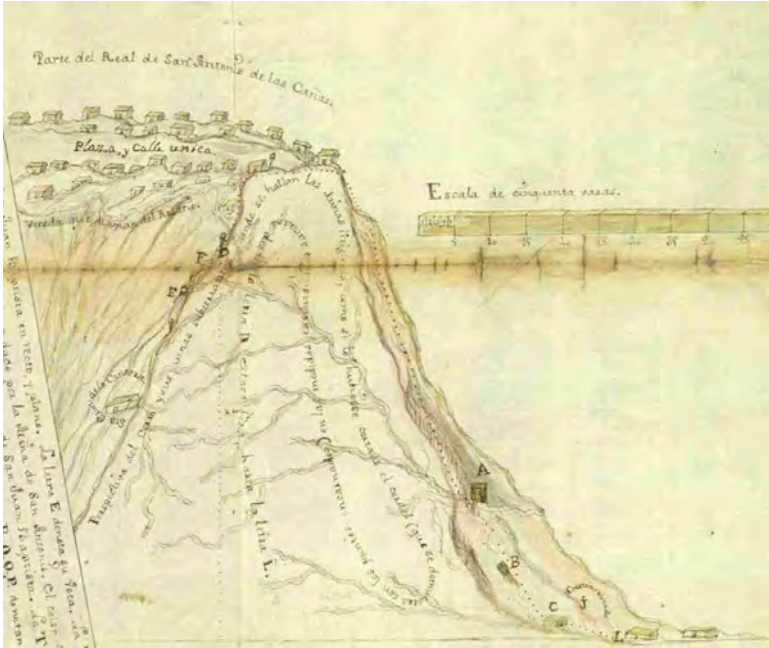


Figure 9.10: Royal Mines of San Antonio de las Cañas (detail of the background, naturalistic style).



Figure 9.11: Royal Mines of San Antonio de las Cañas (detail).

The map depicts the western face of the mountain, with the flora and the wide river that runs down the valley. It is supposed that the map should be shown first folded at the middle of the mountain, creating the effect of seeing the mountain from the side of the river opposite the mountain. When unfolded, the authors state in the legend, “it is possible to see the benefits that would result from continuing the works numbered 6, by digging deeply 50 *varas* more, as it is shown in the interior.” These benefits are basically the opportunity to drain several mines by almost tripling the depth of the channel on the northern side of the mountain (layer number 6), and thus being able to mine the layer numbered 15. So it is a map, and a section, and a project. Conceptually, and by means of this rather innocent contrivance, it stresses the unity of the mining complex as something that cannot be reduced to the galleries and veins. By then the miners were quite aware that roads, waters, and woods were essential parts of the mine.³⁶

During the following decade, traditions of depicting small mines both in a naïve but naturalistic fashion (Fig. 9.13) and in a more or less complex geometrical style persisted (e. g., Fig. 9.14 and Fig. 9.15). The trend that was going to prevail was that of visualizing the mining complex within the whole mountain.

This trend was not exclusive to Nueva España. Juan Francisco Navarro’s *Diseño del Cerro de Potosí* (1779) is a good example of the presence of this style³⁷ in the Viceroyalty of Peru. However, the wonderful map of the Minas del Real de Zacatecas (1789) (Fig. 9.16), drawn by Fermín de Reygadas at the request of the company mining, was based on a draft by the mine administrator Ventura de Arteaga. Its combination of perspectives signal both the extension and limits of each of the singular exploitations, the depth of the galleries, and the direction and inclination of the veins, with the names that qualified them by the nature of the mineral, as well as the several rivers that cross them. It thus captures the extent of available knowledge about the structure and disposition of the “perpendicular strata” attained by the miners in Nueva España.³⁸ By then, due to institutional changes and the implementation of companies of mines, mining developments and “reales de minas” began to be ruled by big companies that offered a new model which tended to displace the understanding of the mining district as a set of small private unconnected exploitations. The creation of the Board of Mines (1774) also left quite a lasting mark on the conceptual use of these maps, but the

³⁶See Lassaga and León (1979 [1774], 33ss).

³⁷This style would last for a long time in the fashion of a blueprint. See, for example, Mina de Veta Negra, Sombrerete, 1826. AGN, Mapilu.

³⁸It is worth noting that Fermín de Reygadas (*ex-piloto náutico* and expert in mines and metals, one of the first graduates of the Real Tribunal General de Minería) depicts the inclination of the main vein in two points—signaled in the map as EP and EC, that is, Catas de Proaño and Concepción, áreas 8 and 9 respectively. From this information he was able to determine the extreme irregularity of the vein inclination, as well as the adjacent ones, since all of them run in parallel.

main result of these successive graphical works, an enduring view of the mining complex, was a collective, agonistic, and multiple-focused accomplishment.



Figure 9.12: Royal Mines of Tlalpuaxhua, Michoacán, 1773. (Archivo General de la Nación, México. Mapas, planos e ilustraciones, 2746.)

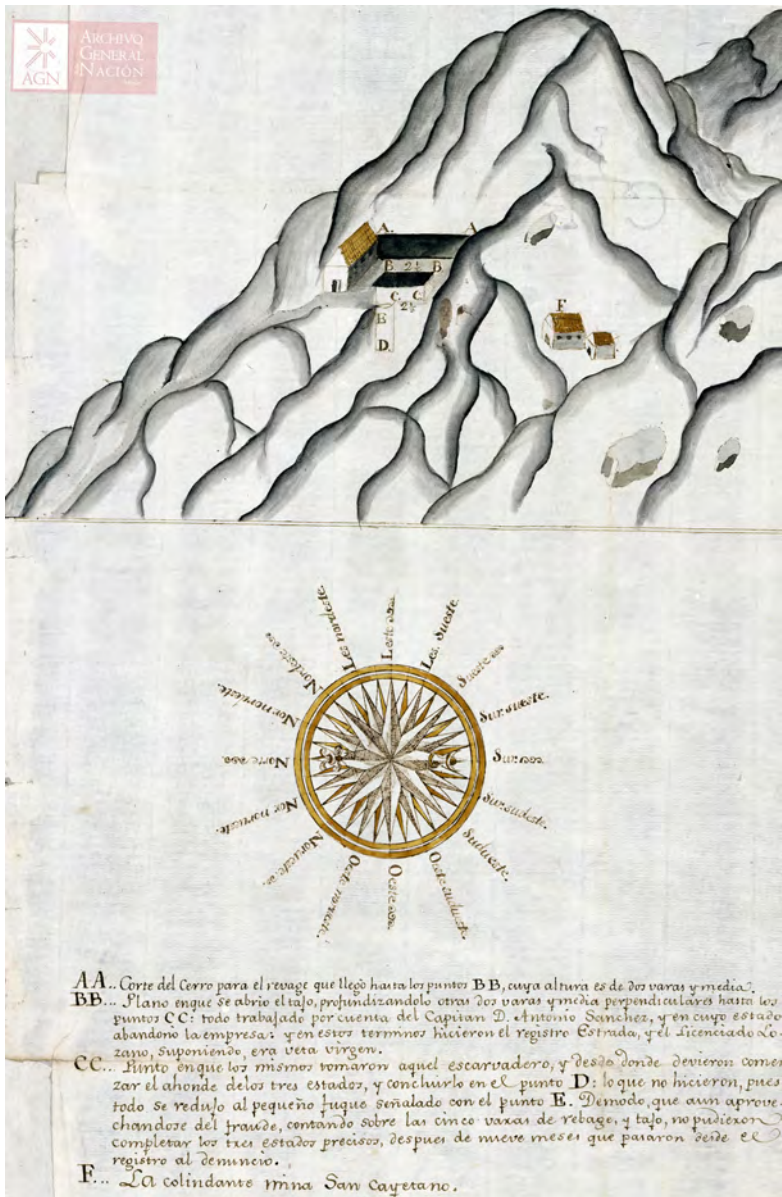


Figure 9.13: Mines of the Señor de Zabala, Real del Catorce, San Luis de Potosí, 1783. (Archivo General de la Nación, México. Mapas, planos e ilustraciones, 2779.)

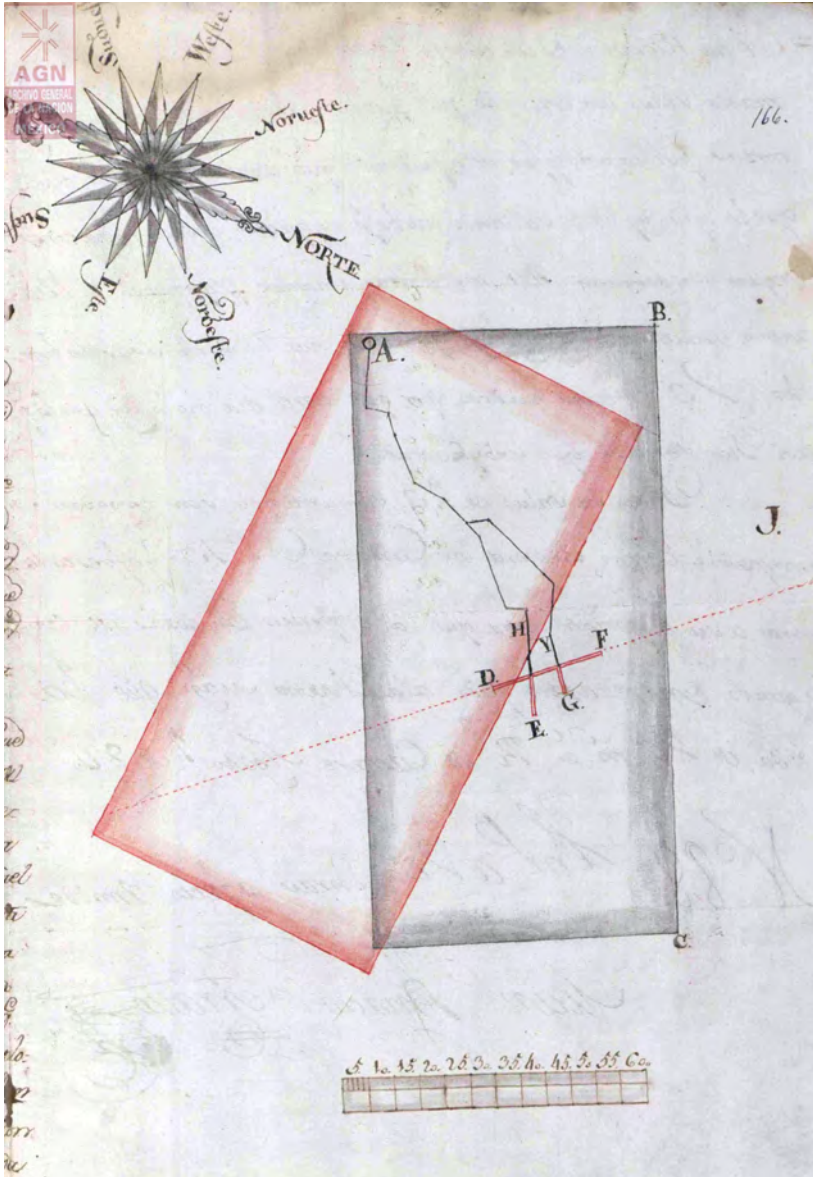


Figure 9.14: San Cayetano Mine. Sultepec, Edo. México, 1783. (Archivo General de la Nación, México. Mapas, planos e ilustraciones, 2749.)

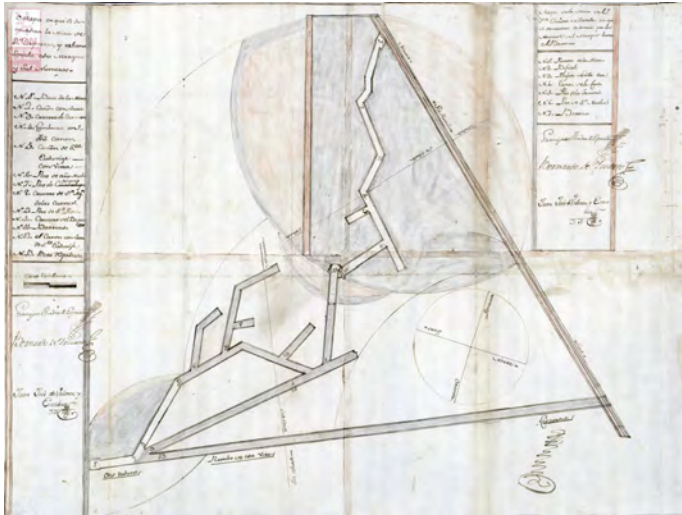


Figure 9.15: San Cayetano and Santo Christo de Zabala Mines. Guadalajara, Jalisco, 1784. (Archivo General de la Nación, México. Mapas, planos e ilustraciones, 2768.)

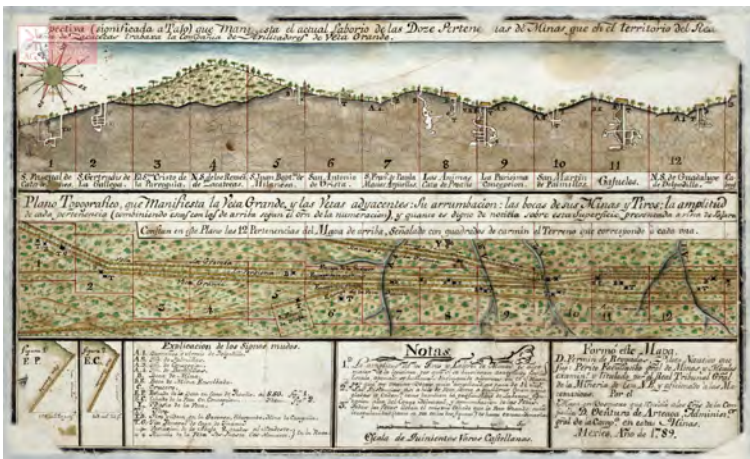


Figure 9.16: Royal Mines of Zacatecas. Zacatecas, 1789. (Archivo General de la Nación, México. Mapas, planos e ilustraciones, 2766.)

Conclusions

Economic reasons and geometrical imagination used as foundations of notions about fairness are probably general features shared by all mining representations, as the very practice of measurement made this conceptual system its teleological end (Goody 2004). But in the particular context of Nueva España, that is, in the context of a space where the legal framework opened the possibility of establishing an economy of knowledge by accomplishing the goal of securing imperial and local interests, manuscript mine maps produced in a not strictly standardized and formalized way acted as catalysts for the tensions surrounding mining activities by flexibly enrolling different voices, memories, projects, and fears. They did so quite locally and hence, a sense of singularity and fragmentation, even uncertainty, emerges from the reading and circulation of these documents in their time as well as today.

But they also created a way to consolidate epistemic practices and conceptual constellations not across trading zones and disciplinary fields,³⁹ since neat differences between them did not really exist, but through spatial topographies supported by different languages, codes, and narratives. First, they constructed the relevance of the interior of the mountain as a critical effect of a historical narrative and legal record that required further visual treatment for an adequate expression, including moral and personal values. They further refined this expression by attempting to introduce the third dimension and a more holistic understanding of the mine as an entity that structured the underground and the territory. Thus, the core of the pictographic challenge they faced was not the mere and accurate depiction of the mine, but its imbrication with its surroundings, the understanding of its singular place in broader social, economic and communitarian contexts. In this sense, there is no point in dwelling on the backwardness of the measuring practices.

Instead, I have stressed the conceptual richness of these maps. Abstracting the practice of mining as one aimed at revealing tree-like structures, co-constructed with the practice of measuring, allowed the generalization of these structures as a feature of both the mountains and the mines. The maps also created social orders—after all, social prestige, despite uncertainties, was connected to the kind and part of the vein owned. In this way, experiential approaches and conceptual expectations came together, as they found a visual support that made their circulation and consolidation possible. Moreover, success in consolidating a more holistic way of perceiving and representing the relationship between veins, mines, and their environment was coupled with a more dynamic understanding of their natural history. These abstractions additionally established new connec-

³⁹On the notion of trading zones, see Galison (1997).

tions with other topographies also based on veins and *intervenios* (spaces between veins) as medical ones that should be further explored.

Certainly, the description of the minute changes and achievements of manuscript mine maps helps us to understand important continuities between apparently distant styles often polarized as cutting-edge and backward or technically achieved and failed. In later maps, the intentionality of the miner, the identification of the mine design with the moral personal dimension of the owner, somehow collapses. Depicting the whole as managed by a single company diluted the agonistic approach that was inherent in the disperse and distributed structure of mining, but it also brought additional transformations. The stylization of the treelike structure in a wider space led to more squared, grid-like representations, that made the interstitial spaces look more continuous, as well as accomplishing sheath-like functions that explained the presence of the lode. On the other hand, the creation of the Board of Mining, and the emergence of an imperial project of the institutionalization of mining knowledge—represented, in the case of mining, by the Royal School of Mining of Vergara (Basque Country, 1776), the School of Mining in Almadén (1777), the Royal School of Physics, Chemistry and Mineralogy (Madrid, 1787) the Chair of Geology and Mineralogy in Royal Cabinet of Natural History (Madrid, 1788), and the Royal School of Mining of Mexico (1792)—and administrative rationalization,⁴⁰ represented a further, irreversible step towards standardization of practices. These institutions tightened control over the theories that stemmed from (or still dwelled on within) non-institutionalized spaces and/or epistemic cultures,⁴¹ but, of course, they did not entirely erase the depicting practices and their consequences. Consequences such as the environmental conception of the mine were certainly settled. Thus, the above mentioned formal transformations also allowed for a more unified way of thinking—a more routinized and sedimented one—about the stratigraphic orders that populated many late eighteenth- and early nineteenth-century disciplines. But they could hardly be explained without these previous strategies that gave a local perspective and general scope to mines and mountains through visual languages.

⁴⁰I noted elsewhere that these institutions were linked to governmental secretaries or military departments and their research was oriented towards the optimization of energetic and natural resources, Valverde Pérez (2007, 92).

⁴¹See, for example, how technological improvements were rejected by the Board of Mines on the basis of the old-fashioned theoretical framework attached to their explanation in Trabulse (1981, 325).

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Chapter 10

Coal Mining in Cuba: Knowledge Formation in a Transcolonial Perspective

Helge Wendt

No flash of genius of a Crompton or a Watt could transform coal mining. Better methods had to be slowly forged from the painful experience of common men, and only gradually did a new idea or a new device spread from pit to pit, or from one coalfield to another. Development came with the growth of markets and the emergence of new uses for coal, rather than with changes in technique, though these new markets and new uses themselves depended upon technical changes in transport – upon the development of roads, canals, and, above all, of railways. (Ashton and Sykes 1929, 12)

In developing her coal fuel technology, Britain built up a broad band of techniques in furnace design, building and ventilation, in the choice and use of refractories, in boiler making, in the production of large iron plates and castings, in the provision of cokes, and in the important but now obscure craft techniques of furnace management. There was already by the eighteenth century a number of important coal-using processes which could not be used with other fuels. (Harris 1976, 168)

Introduction

The coal that was found in Cuba in 1828 turned out to be of rather bad quality. The history of coal mining in Cuba is thus very short—maybe too short in time and too limited in personnel for knowledge from other coalfields to have influenced the island's coal industry. Nevertheless, this short history has led to an investigation of alternative ways of industrialization. As is well known, at this time the production of sugar dominated the Cuban economy. Additionally, from the 1830s on, new industries appeared such as copper mining, steam engine transportation and machine construction. The island was still under Spanish colonial

rule and the political sector was divided into conservative loyal, progressive loyal and progressive independent parties.

The particular situation of Cuba in the nineteenth century impedes an exclusive concentration on the Spanish colonial empire. Any analysis of the colonial situation cannot focus solely on the limits of the political space set down by colonial powers. The bonds between the colonizing political entities and the colonized areas were not so tight as to be considered the only valuable relationships to exist, nor have colonial boundaries proven to be so potent as to form a closed spatial entity. On the contrary, colonial territories were extremely open spaces and hosted relatively open societies in which processes occurred that in the so-called “mother countries” would have been unthinkable. Thus, relationships endured the military conquest and reached far beyond the newly set political and social borders, altering the political intentions of colonial powers and setting off multiple processes like *métissage* (Gruzinski 2004), political opposition to colonial domination (P. Chatterjee 1993; Mignolo 2000) and economic emancipation (Bayly 2004; Osterhammel 1997).

The transfer of knowledge, which is one of the lessons to be drawn from previous historical globalization studies, has to consider those relationships that trespass geographical and political borders and limits formerly taken for granted (Werner and Zimmermann 2006). This perspective questions the exclusiveness of the access European mother countries claimed to have to their colonial territories and subordinated people. The economic history of black markets (Böttcher 2011), the colonial history of Christian missions (Wendt 2011), the history of scientific development (Baracca 2014) and of mining (Bakewell 1971; Brown 2012; Hausberger 2009) all deliver various transcolonial examples of how colonial borders were permeated by individuals, companies and other social entities.

The transfer of knowledge, at least as emphasized by post-colonial inspired scholars, occurred not only between European countries and their colonies, but also between different colonies. The coal issue exemplifies such transcolonial transfers of knowledge. Often, knowledge in the colonies was gained despite colonial domination. The colonial situation was much more diverse than the much-discussed opposition between the colonizers and the colonized. Various groups were acting in the fields of politics and economics: there were (in colonies other than Cuba) different indigenous groups that tried to preserve a certain political, social and economic status by maintaining relationships to other indigenous groups, to the colonial administration and to different social groups (such as merchants, missionaries, *criollos*, etc.). The *criollos*, descendants of European migrants to the Americas, had different degrees of affinity to the colonizing power.

This situation means that only parts of the colonial society were able to exploit and reassemble circulating information with the aim of creating new knowledge. We are dealing furthermore with a lack of information on the character of knowledge in the colonial intercultural situation. Knowledge and knowledge formation processes are culturally different; they vary locally and differ in the aspects of innovativeness and further diffusion. When in the late 1820s a small but promising coal deposit was found near Havana, the Cuban society, the Spanish authorities and potential investors and buyers of that coal had to develop and employ knowledge that for them was new, even though coal mining was already a well-established tradition in other parts of the world. The problem these people faced had potentially long-term effects, although the economic impact of coal in Cuba was relatively small.

In this paper, I rely mainly on documents from the Spanish National Historical Archive in Simancas.¹ Some treatises on mineralogy and coal from the beginning of the nineteenth century, written in Spain, France and Great Britain, have also provided precious information that allowed an overview to be established of what was known about coal at that time.

Coal in Modern History

Different Forms of Industrialization

Talking about coal in modern history often relates to the history of industrialization and thus to modernization. I use the term industrialization to designate changes in a large number of processes in socio-economic systems. Those changes comprised the production of goods, their consumption and the energy available to increase production rates.

Jan de Vries has focused on the consumer revolution that began in the late sixteenth century and comprised ever more people in a mass-movement of individuals (Vries 2008, 36). Their demand for goods that were once considered luxury items led to an ever-greater need for larger amounts of energy and energy-rich resources (Vries 1994; 2008; Bayly 2004). This was not just a European phenomenon but also occurred in the colonized world, as well as in parts of the world that were independent of European domination, such as China or India (Wright 1984; K. K. Chatterjee 2008; Ranade 1906).

Other global processes included the so-called “industrious revolution” and “globalized,” terms coined by Jan de Vries (1994) and Christopher A. Bayly (2004), respectively. These terms were picked up, for instance, by Robert C. Allen and Jacob L. Weisdorf in restructuring the narration of the industrialization

¹Available online at <http://pares.mcu.es>.

process. And Sheilagh Ogilvie (2010) proposed to decenter both objects of research from the North Atlantic environment and investigate “both revolutions” in other European regions.

Taking up the research of Akira Hayami, Kaoru Sugihara (2004) has stressed the difficulties in comparing Northwestern European and Japanese histories of industrialization on a global scale. In contributing to a comparative history of industrialization, Sugihara researched the issue of governmental politics and the industrious revolution during the Tokugawa shogunate in Japan. To establish a typology of how industrial processes changed in Japan, Sugihara focuses on the East Asian history of technologies where a more efficient production method was evident, as well as an accumulation of “human capital” in the form of skilled and literate workers. In contrast, as Sugihara underlines, Jan de Vries (1994) suggested that Europe concentrated on demand, and Kenneth Pomeranz (2000) proposed to research processes of capital accumulation (Sugihara 2004, 8).

This short discussion about early industrialization processes is important to indicate alternative ways of industrialization. This means that the way in which changes occurred in different social-economic systems differed from the socio-economic organization and the resources available. The Japanese path to industrialization in the eighteenth and nineteenth centuries, for instance, relied less on the accumulation of capital or increasing mass-consumption, but instead on the efficient organization of labor processes related to restricted land and labor.

Efficiency and (Global) Industrialization Processes

The history of coal is not confined to the (Northwestern) European history of industrialization that often considered coal as a substitute for timber and the substance that made changes in production processes possible. David Landes (1969; 1998) and Eric Hobsbawm (1975), for instance, treated coal and iron as being intertwined in a co-evolutionary process. Putting coal into a global history framework, Kenneth Pomeranz (2000) has repeatedly referred to this motor of industrialization and to the importance this combination had for Chinese and Japanese modernization processes (Pomeranz and Topik 2006).

Another argument should be made when investigating the history of coal use in different regions of the world, even if these regions were under European colonial domination or integrated into a “Western” economic system and culture. In regions of the world where historiography is typically related to a Western model of industrialization, coal is often put in the context of iron. But that is to argue that many more production processes can be considered in which coal was a useful combustible for increasing production rates and ameliorating efficiency of production. The use of coal comes from a long history that began in the seventeenth

century when all demands for energy were met almost exclusively with organic materials. As Richard Adams (1975) emphasizes, in the seventeenth and eighteenth centuries the European economies were developing from an agricultural to a paleotechnical phase. Instead of “agricultural phase,” authors Deléage and Debéir (Debeir, Deléage, and Hémery 1986) employed for the same era the term “organic époque,” when exclusively organic energy resources, mostly produced during agricultural processes, were converted into power. Almost the entire mass of energy was extracted from organic materials at this time. Corn, human and animal power, wood and water or wind were the only raw materials used for obtaining energy.

In the late eighteenth century, a change in the energy system took place which affected, among other things, the production of manufactured objects. In a time span of one hundred years, fossil energy resources like coal and later petroleum gradually but profoundly changed the economic and social landscape throughout the world. At the same time, the second green revolution (after the first, the Neolithic revolution) of the late eighteenth century transformed cultivation and husbandry in European and American countries (Overton 1996). The changes in agriculture relied partly on experiences and materials from the European colonies, which were then partly transferred back to the colonized regions. This process affected the social, scientific (Sigaut 1998) and economic contexts in rural areas by helping to produce an ever-increasing mass of organic energy resources like meat, vegetables and fodder for animal husbandry.

Both production sectors—manufacturing and agriculture—were related to one another, but a large part of the labor force now left the agricultural sector to seek manufacturing jobs in workshops and factories. This growing class of workers was nourished by the increased agricultural output. The industrial sector produced instruments and machines, and later also fertilizer for agriculture. The second green revolution thus comprised a mechanization of parts of the agricultural working cycle. In addition, by using new or combined breeding methods, much more efficient species of plants and animals could be created in comparison to traditional species. New types of wheat were able to bear ten to fourteen kernels, rather than the usual eight. This signified a considerable increase in energy production of between 20 and 40 percent per acreage of land. Here we find a third reason why the energy question became so relevant in the late eighteenth century: higher agricultural yields were related to Malthusian theories of limited population and economical growth, which could only be surmounted by an increase in agricultural production. Paolo Malanima comments on the European situation:

We can summarise the different levels of consumption in the European agrarian society and in other 18th-century societies by saying that, while in European society these were around 15,000 kcal per

capita per day, in non-European societies they were between 5 and 10,000 kcal.

The European agrarian civilisation, characterized by short growing seasons with one, mainly low yield harvest of cereal, such as wheat, per year, needed a higher average consumption per capita, with its numerous working animals and the long months of low temperatures. It was therefore more vulnerable than other agrarian civilisations to the increase of demographic pressure, with the growing demand of energy that this entailed. (Malanima 2009, 85)

While today the Malthusian trap is disputable, throughout the nineteenth century the conversion of energy became a major catalyst for inventions in areas as diverse as industrial and agricultural production, economic organization, urbanism and individual-state-relations.

The conversion of black coal into heat was therefore important as it helped to match the expectations of increasing production. Steam engines could help to raise water from mines that extracted minerals and metals from ever-deeper strata. Coal gas, obtained after distilling the mineral, illuminated factories and public spaces. When the construction of railroads spread throughout the world and more and more steamships navigated coastal waters, large rivers and later the oceans, coal was needed to move them. To supply the increasing coal trade, the first mining centers in England, France, Germany, Spain, the United States, South Africa and Australia shipped coal to the remotest parts of the world. Deposits were created and continually restocked (Duncan 1972).

This black backbone of industrialization permitted, for instance, an increase in iron production, which in turn became the basis for the construction of steam engines and railways and demanded an ever-greater amount of coal. Consequently, the demand for products requiring coal for their production process stimulated the search for new coal deposits, the advancement of pits in ever-deeper strata and also promoted the irreversible progress in production and knowledge economies relying on coal. The turnaround of fossil resource energy through the massive exploitation of coal and its application in production processes and transportation thus added an additional stratum in the energy supply of European, Asian and American societies.

Coal in the European Context around 1800

Early Developments in England

It seems that the use and knowledge of coal cumulated over a period of several hundred years. From the beginnings of the coal trade in England from the fourteenth century on, there were many obstacles in history to the diffusion of coal use. To name a few, there were several restrictions on its sale in London, coal mining in northern France was under both English and French rule. Paolo Malanima states that by 1620, the economic status of London already depended entirely on access to black coal:

Coal in England had become more important than wood as a provider of thermal energy by the 1620s. The proportion of coal in total energy consumed was 12 percent in 1560, 20 in 1600, and 50 in 1700. (Malanima 2009, 61)

Since the reign of Elizabeth I and James I, coal had become a vital resource, for example, in heating houses and for use in forges (Crouzet 1966, 53–56). Coal could be used in other processes, for example, from the mid-eighteenth century in iron-smelting processes after Abraham Darby and Henry Cort discovered how to desulfurize pit coal to produce coke. During the seventeenth and eighteenth centuries, the sectors of production where pit coal could be used had multiplied and some of these were only able to develop thanks to this mineral. Transnational transfers of knowledge on the use of coal made such developments possible in the first place, among others, the “invention” of the steam engine (Nef 1966, 243).

John Nef, author of *The Rise of the British Coal Industry*, also mentions that there was a shortage of timber for producing charcoal, and also that it was widely believed that black coal had a lesser impact on the environment and deforestation (Nef 1966, 195). The observation that by using pit coal instead of charcoal, the forests and woods could be better preserved was ascertained knowledge from the seventeenth century on. This development of substituting timber with coal (and later with petroleum), as E. A. Wrigley has pointed out, was a *longue durée* process: “It took a quarter of a millennium for coal to change from supplying a tenth of the energy consumed in England and Wales to nine-tenths” (Wrigley 2010, 243). From a history of science perspective, these 250 years wherein a change in energy supply took place was also a period of newly developing knowledge (Wrigley 2010, 99).

Besides the use in households and forges, and in mines to fuel engines and raise water, the English development of coal usage comprised processes of knowledge formation that can be observed, for instance, in the writing of Robert Boyle.

In the second part of his *Natural Philosophy* published by Thomas Birch in 1777, he wrote:

And that, which was very convenient in this contrivance, was, that whilst the pit-coal was charring, it afforded him a very intense heat to meal or calcine the minerals, he had occasion to expose to it: and he confess to me, that by this method, he saved three parts in four of the charges the keeping such great and constant fire, with common charcoal, would cost him. (Boyle 1777, 141)

In this chapter, Boyle referred to the potential for pit coal to act as a substitute for combustibles such as charcoal because of its newly discovered abundance and the characteristics that made it accessible for an extended period of time. Boyle could already rely on a broad knowledge of black coal and even referred to some knowledge of economics.

The co-evolution of a social activity, such as production and consumption, and of a new epistemic field—the investigation of possible forms of black coal usage—already encompasses features of the future age of the Anthropocene. Herein, the exploitation of natural resources and the employment of ever-higher amounts of energy to increase production rates are already visible patterns of thought and action. To substitute one resource with another to preserve the former and to obtain an economic advantage also belongs to that logic.

Coal in the Economic Contexts of France and Spain

In the late eighteenth century, England was a model for all those in Europe and abroad who wished to develop a mode of industrialized production. Writers in Catholic societies in France and Spain commented on the new production modes in England and made some efforts to implement comparable forms of production in their own societies, which also used coal. Anne-Robert-Jacques Turgot wrote, for example, that coal could be a useful economic medium. He referred to the case of England, in particular of Newcastle. Comparing the English case to that of the French, the statesman and famous physiocrat stated that French coal was inferior in quality to English coal. This would have been the reason why in France the use of coal in the mid-eighteenth century was rather rare and only a limited legal system directing the coal economy existed. In a short treatise “*Mémoire sur les mines et carriers,*” Turgot wrote:

The coal mines of Saint-Étienne en Forez (Loire, France) did not wait to be regularized in 1744 to provide the manufactures of that city with an enormous quantity of coal; they have prospered because of the liberty they have taken. (Turgot 1844, 158)

When English coal was imported into France, Turgot was convinced that English coal mining had accumulated knowledge that could be useful for the economic development of France, too, even though past experiences in France could have served as a model for the further co-evolution of industry and the mining sector (Crouzet 1966). This was the argument given by a member of the French Academy of Sciences, veterinarian and coal mining expert, Jean F. C. Morand, when he wrote extensively about coal mining in northern France. It was due to a lack of knowledge in the French territories about current coal mining practices that this mineral was used by only a few industries. For the French case, Morand (1776) stated that this was due to an absence of communication of knowledge for improving the coal mining industries in France. Although Morand aimed to underline the importance of French coal mining, he conceded the much longer experience and leading position of English coal industries.

Similarly, the Catalanian director of the Botanical Garden in Barcelona, Joseph Comes, reflected on the question of why England had become such an economic power. The short historical overview of his report entitled *Memoria sobre el carbon de piedra para persuadir y facilitar su uso en Cataluña* began with the English laws that prohibited the cutting down of trees. Comes saw this law as the reason why in England a combustible was sought with substitutive potential. Consequently, the English began to employ black coal in a wide range of economic fields, which he lists: “domestic firing, combustion in factories and finally the smelting of metals” (Comes 1786, III). Comes considered this variety in the use of black coal as a reason to begin exploiting coal mines in Spain.

Comes understood that the French physiocratic principles of agriculture as the backbone of the national economy meant that no agricultural product, such as wood, should be wasted in producing a material that could be provided by another sector of the same economy. This was the case for black coal, which contrary to timber or vegetable charcoal, did not rely on agricultural production cycles and the man power necessary for a prospering rural economy; it was an economic branch in its own right (Comes 1786, IV–V). As Comes stated in 1786, although many coal mines were being exploited in Catalonia, the use of coal in northwestern Spain was rather limited. Despite the fact that coal mining was of rather low importance in Spain, some coal mining regions did appear from 1800 on.

One center of coal mining in Spain was Villanueva del Río, around 50 kilometers northeast of Seville (García Montoro 1997; Álvarez 1987). Villanueva del Río, for instance, had a royal coal mine concession from the 1770s and produced around 500 tons of coal per year. When in 1792 the concession was revoked, private activities undertaken until 1799 increased production to 1,500 tons per year. In Asturias, the Navy, which produced iron bars for ballast in ship construction,

mostly exploited coal. At the turn of the century, a total of only 15,000 tons of mineral coal were extracted annually from Spanish coal mines (Coll Martín and Sudrià i Triay 1987, 39; Gómez 2005, 259–260). It is worth comparing here the annual consumption of coal by the copper mines of Río Tinto in Andalusia in 1855, which was approximately 230,000 tons per year (Anciola and Cossio 1856, 148). Most of this coal was imported from England and transported via the port of Huelva to the copper furnaces of Río Tinto. Coal mining in Spain could thus only partly contribute to the industrialization process, as many authors have pointed out (Terán Troyano 1999, 24–25).

Other examples of transcolonial economic interaction are the powering of transatlantic navigation and the global commercialization of coal. At the turn of the century, these signaled the very beginnings of economic interaction but became a major factor in the organization of transoceanic dominion. Geological knowledge of where to find coal, of the different characteristics of the various types of coal and the possibilities of its use in production processes evolved over that long period of time. Spanish policy makers, in their transcolonial analysis of the political situation, were conscious of this new geopolitical field and tried to keep up with the changing situation.

Coal in Colonial Spanish America around 1800

A Short Historiography of a “Rare Mineral”

Black coal in the Iberian colonies is a rather undervalued issue. Modesto Bargalló (1955) in his basic study on mining and metallurgy in colonial and post-colonial Mexico does not even mention coal mining. Nevertheless, Bargalló hints at how important coal had become for the Mexican national economy. Reviewing the foundation of iron smelting companies in the state of Durango from the mid-nineteenth century, he states that one of the furnaces was forced to close down because coal for the smelting process was too expensive. Related to the same problem, other companies were sold several times and often passed from Mexican to US or British proprietors who could access black coal more easily and at better prices.

Generally it can be stated that during the nineteenth and early twentieth centuries, coal was a precious commodity in Latin America, but because the coal mined there was often of poor quality, it had to be imported from distant regions (Glade 1997, 52–53). Such statements can easily be traced to Alexander von Humboldt’s writings about black coal in Mexico, a country he visited at the beginning of the nineteenth century. Whenever Humboldt made mention of any deposits, he described them as being scarce and dispersed. Coal was rarely found

in the Cordillera, therefore the main sources were in New Mexico, Texas and Louisiana (Humboldt 1822). All three of these regions became US American territory during the nineteenth century. From the early 1830s, several expeditions in the Rio Grande area had given indications of coal deposits (J. A. Adams 2008). But it was only after the US Mexican War (1846–1848) and the expulsion of hostile Indians from that region that it became possible to mine coal on both sides of the river (Calderón 2000, 133) and US-dependent companies began to exploit coalfields south of the Rio Grande around 1900 (Bernstein 1952). It was only at the turn of the twentieth century that coal was exploited at different sites in Coahuila (Boletín Minero 11, 5 (1927), 627–709).

In contrast to the history of coal mining in Mexico, in Chile coal mines were in operation from the 1840s. Luis Ortega mentions Las Vegas de Talcahuano, the first coal mine to be regularly exploited from 1841. This mine was run by the British citizen John Mackay who sold the mineral to navigation companies (Ortega 1982). The main development of Chilean coal mining, comprising as many British as Chilean entrepreneurs, was due to the increasing sector of copper mining. To implement a national smelting industry, large amounts of fuel were needed and this could only be covered in part by wood and charcoal (Folchi Donoso 2001; Veliz 1975, 648). In 1859, more than 172,000 tons of coal were mined in Chile, mostly from the mines of Talcahuano and Coronel (Ortega 1982, 9). Other Spanish-American areas to develop coal mining in the late nineteenth century were El Cerrejón in eastern Colombia or Río Turbio in Argentina.

In the late nineteenth century, the US government demanded that its consuls in all of the Latin American consular districts report the importation and regional exploitation rates of black coal. This demand and the reports sent to Washington show the extent of global interconnectivity of coal trade at the end of the nineteenth century, as well as the transcolonial relations that were influencing the young independent states. Thirty-two of a total of eighty-three pages of the consuls' report were dedicated to Mexico (Special Consular Reports 1891). From the 1880s on, the charcoal that had previously dominated the heat-intensive production processes in Mexico was progressively replaced by black coal (Rankine 1992). In 1890, when the consuls' report was established (it was published in 1891), coal that was used by Latin American nations mostly originated from England, the United States or Germany. But some consuls reported on regional production, which potentially endangered US influence on the national economies.

Spanish-American Mining — Independent from Coal

There are several reasons why coal in the Spanish speaking countries of Latin America did not play the role it did in the US or in Europe. Black coal had only limited value in the Spanish colonies because the industrialized parts of the colonial economy already worked well without it. These branches of industrialized production could rely on rather still abundant organic fuels and had developed production processes that diminished the quantities of used fuels. In colonial times, the main industry was the mining and smelting of silver. In pre-Spanish and early colonial times, the smelting process relied on the relatively high temperatures achieved in special stoves in which a fire was maintained in the lower parts using wood or charcoal the ore was smelted in the upper parts. To reach the high temperatures, natural winds or blow tubes were employed. When the Spanish learned the amalgamation technique of mixing the ore with mercury (Teich 1975), first used in 1554 in Mexico and from 1572 in Potosi (Hausberger 2009), high temperatures were no longer needed for the smelting process (Ramírez 1994, 102).

After this technological of amalgamation, the Amerindians were no longer able to compete with the Spanish mine owners, who could now produce much higher quantities of silver using less fuel. Nevertheless, they still needed wood and charcoal for the increasing silver smelting activities (Bakewell 1997, 119–120). The implementation of the amalgamation method in the main silver industry areas, Otis E. Young underlines, should be considered a technological innovation, comparable to methods commonly used in Europe. Here, a large amount of fuel was used to reach the high temperatures needed for smelting silver ores (Young 1994, 115). The reduced quantities of wood and charcoal needed because of the use of mercury in the amalgamation process meant that no long lasting interest in natural black coal deposits evolved. Thus, the amalgamation process, a relatively fuel-efficient and low-cost technology, became established in all parts of the Spanish American Empire. In Huancavelica, where wood for heating the amalgam became scarce, timber was substituted by *icho*, a type of grass (Moore 2003; Studnicki-Gizbert and Schechter 2010). In the Zacatecas silver mining region, there was no lack of timber as charcoal could be obtained from the surrounding canyons (Bakewell 1971, 146–147).

Mercury was mined in Huancavelica in Peru, in the so-called “death mine” near the largest silver mines in Spanish America. Before mercury was discovered in Huancavelica, another important mercury mine, located in Almadén in Spain, supplied the silver regions of New Spain (Bakewell 1997, 120–122). In Almadén, the first Spanish mining school was founded in 1774. This new school quickly became part of a transcolonial network of knowledge exchange, mostly with the

German mining schools of Banská Štiavnica (Schemnitz) in Austrian Slovakia (1735, resp. 1770), Freiberg in Saxony (1765) and Clausthal in the Harz-region (1775), which had been founded in the same period. This European network of mining knowledge transfer was comprised of French and British academies and mining schools. All of them concentrated mostly on geological surveys, the construction of galleries, drainage and how to employ machines for these purposes. The treatises and curricula dealt mostly with silver, mercury, copper and iron, but neglected the geological and mineralogy characteristics of black coal and the technologies of coal mining.

The dark side of the extensive use of mercury (and lead) in Spanish silver production was the enormous impact it had on the health of humans and animals, and the contamination of rivers and surrounding landscape (Brown 2012). The silver industry profoundly reshaped the Andean landscape, as great amounts of water were needed to wash away the waste from the mix of silver, mercury, rock, sand, chalk and other ingredients (Moore 2003). From the seventeenth century, the industrialization of the silver industry was accelerated with huge investments of public capital; private capital was accepted only when submitted to the regime of concessions. Concessions did not allow investors to act in their own right but rather allowed the official authorities to take precedence over private investors. Furthermore, the Crown held a monopoly on mercury, impeding its exploitation anywhere other than in Almadén and Huancavelica. It also blocked the importation of much less expensive mercury from outside the Spanish Empire (Trabulse 1988), and a royal decree from 1694 expelled the Fuggers—a German trade and bank company to which the Spanish Crown had become heavily indebted to—from Almadén (Bakewell 1971, 167). Here, transcolonial interrelations were banned by a strong governmental act against mercury importation.

One of the main features of Spanish mining history is that, since all mines belonged to the Crown, concessions accorded to private capital investors were very strictly associated with estimated yields and renovation work. In contrast to the British situation, mining industries in the Spanish domains did not represent an economic sector where private investors could expect to accumulate massive capital (Chastagnaret 2001). Nevertheless, silver mining in Spanish America can be seen as an “industry” that expanded to many Spanish American areas with silver deposits. Besides Huancavelica, Zacatecas should also be mentioned as the other most important Spanish silver region (Bakewell 1971; Brown 2012).

With the arrival of steam engines, economic activities in the colonies began to diversify and coal became an important factor for sustaining these new developments. The Peruvian case shows that more or less abandoned silver mines were reopened with the help of steam-driven pumps (Boase 1818).

Cuban Coal

The Unfortunate History of the Analysis of Cuban Coal

The history of coal in Cuba started in 1828 when the first black coal was extracted. It was discovered by Ramón de la Sagra, who in 1828 published an account of his findings near Havana, at a site called Guanabo. The director of the Botanical Garden of Havana refers to this discovery in a journal he published, *Anales de ciencia, agricultura, comercio y artes*. He combines the description of the coal deposits with a description of copper sites—a combination I will come back to later in this article. The nine-page article by de la Sagra seem to be extracted from a lecture or series of lectures he had given to “the youth of Havana” in a newly founded section of the Economic Society of that town. De la Sagra reports that a piece of coal was given to him, which he first analyzed optically. The botanist could identify a density of 1,18 g/m³ and a composition of 72 percent coke and 24 percent bitumen. By combustion he obtained the following results:

Matière volatile..	28, 00
Charbon.	60, 00
Cendres et résidu.	12, 00
	100, 00

Figure 10.1: Sagra 1828 (reproduced in Sagra 1842, 132).

De la Sagra was not the only one who was optimistic about the discovery of coal. Two geologists published a paper in the *Transactions of the American Philosophical Society* in 1839, referring to the carboniferous deposits. The authors were the Briton Richard Cowling Taylor and the US American Thomas Green Clemson, who apparently came to Cuba as mining experts for British copper mining companies. Before his sojourn on the Caribbean island, Clemson had studied at the Royal School of Mines in Paris. He then worked for some years as a mining engineer in the United States. After his Cuban experience, which lasted at least from 1838 to 1842, he returned to the United States where he became a renowned agricultural advisor and founded the Clemson University in South Carolina. His British colleague, Richard Taylor, had a less academic career. The author of *Statistics of Coal [...] on the American Continent* (1855) approached geology and mining in a more practical manner, guided by the famous self-made geologist William Smith before working as a mining engineer in the United States.

Together, they published the article *Notice of a Vein of Bituminous Coal, Recently Explored in the Vicinity of the Havana, in the Island of Cuba*. Herein, they concluded:

The foregoing examination of this bituminous coal, fixes definitively the respective proportions of its component parts; consequently, it determines the applications to which that combustible would be the best adapted. Its quality of burning with a long, licking flame, gives it many advantages for evaporating, heating surfaces, &c., over many combustibles, which contain smaller quantities of volatile matter. For the generating of steam power, for the boiling or concentrating, the juice of the sugar cane, or for the manufacture of gas, this coal is singularly well adapted. As it contains no sulphuret of iron, the gas manufactured would be free from that very deleterious portion or admixture, which it is so difficult to separate from those gases usually manufactured from bituminous coals containing sulphur. It might also be employed with advantage in manufacturing lamp black (noir de fumée). (Taylor and Clemson 1839, 195)

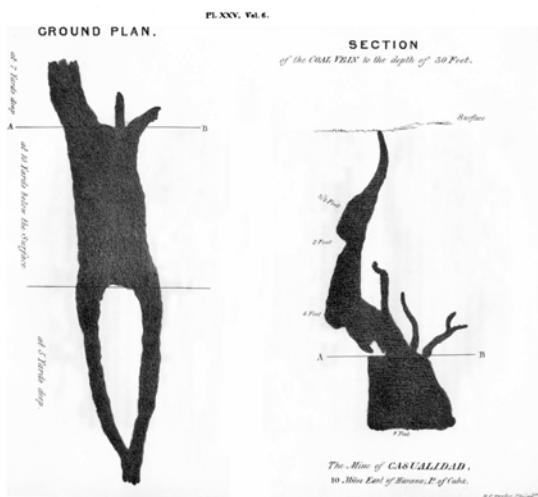


Figure 10.2: Plan of the coal deposit (Taylor and Clemson 1839).

In 1842, only three years after this paper had been published, Clemson became a member of a commission assembled by Cuba's governor who ordered the commission to report on all mining activities in the country. The conclusion of the final report differed greatly from the positive conclusion Taylor and Clemson had reached in 1839. The commission wrote that when used to heat a steam engine or a smelting furnace, the so-called coal glued up the smelter or furnace. The committee proposed to employ the highly bituminous material instead to produce coke and coal gas. The commission's report finally concluded that these circumstances made the exploitation of the mine La Prosperidad of utmost importance for the city of Havana. It was only a matter of time before the necessity of introducing coal into the economic sector of public and private lighting would become evident (AHN Ultramar 77, Exp. 4).

The analysis by Clemson and his colleagues from the commission of the chemical properties of the matter extracted at La Prosperidad differed from previous analyses, as for instance in 1839 when they concluded: "We have here, in the strictest sense of the word, a coal vein, and unlike any we have before witnessed in any part of the world!" (Taylor and Clemson 1839, 193).

Thus, the report of the commission, as well as a comment on this account by the inspector of mines in Cuba, Joaquin Ezaguirre, stated that the coal of La Prosperidad contained too many bituminous parts in its chemical composition (AHN Ultramar 77, Exp. 4) for it to be used directly in any kind of production.

Ramón de la Sagra, who at that time was living in Paris, asked some of his contacts in Cuba to send him some samples of coal and copper from the Caribbean island. After having analyzed them anew, either by himself or with others, he corrected his results from thirteen years earlier in his most famous work on the physical, political and natural history of Cuba in 1842 (Sagra 1842, 72–73):

Matière volatile.	63, 00
Charbon.	34, 97
Cendres et résidu.	2, 03
	<hr/>
	100, 00

Figure 10.3: (Sagra 1842, 131).

De la Sagra mentions Taylor and Clemson's paper of 1839 and accuses them of mistaking a fissure for geological strata, when they wrote that a unique geological structure could be observed there (Sagra 1842, 130). In his description, the Cuban

botanist includes a more profound geological observation than Taylor and Clemson did, or as he stated in 1828, it would be hard to call the bituminous deposit a “strata” in a geological sense. Sagra admits that the matter could be reduced to “light and voluminous coke” which after combustion would leave only a little ash (Sagra 1842, 131–132).

The erroneous chemical analysis was only one aspect that hindered the flourishing of the coal mining industry. The commission of 1842 suggested that to produce coal or coal gas from bituminous coal, as was the aim in the context of globalized economies, was to make such a matter usable for any commercial purpose. The council was obviously referring to the fast growing economic sector in Europe and the United States. Since William Murdoch had installed the first lighting system in the cotton manufacture of Philips and Lee in Manchester, and published the results in the *Philosophical Transactions of the Royal Society of London*, many factories and workshops (Murdoch 1808), some private homes and streets in London, Baltimore and elsewhere were lit by lamps running with distilled coal gas (Tomory 2011). Still, the installation of public lighting would first be introduced in Havana in the 1870s (Altshuler 1997) and this kind of asphalt found in different deposits on the island would be commercialized only at the beginning of the twentieth century when US companies gained full access to Cuban mining industries (Monthly Summary of Commerce 1901).

Obstacles in the Establishment of Coal Mining

One important problem that Cuban coal miners envisaged was that no proper legislation existed on the island for the mining of coal (AHN Ultramar 14, Exp. 4, 4–4). Under the direction of Fausto Elhuyar, a new mining law was approved in 1825 for all Spanish territories, but its implementation was discussed in many cases. This legislation demanded that a special court be implemented before any real activity could begin (Chastagnaret 2001; Whitaker 1951). Thus, Cuba had no special tribunal that dealt with mining activities. A similar situation emerged in Biscaya and Asturias when the first small, opencast coal mines were exploited by private persons (Gómez 2005, 259).

The problem mining companies encountered within the Spanish legal system are maybe best described in the words of two engineers, Fernando Bernaldez and Ramón Rua Figueroa, at the mines of Almadén:

The corpus of rules of this important public enterprise is comprised today by a heterogeneous series of rules and regulations. Some of them were made in response to momentary necessities, suggested by the political requirements of our unhappy epoch, revised with an almost entire lack of a stable and systematic foundation that should

define without alteration the operations of these industrial and administrative establishments. (Bernaldez and Figueroa 1861, 81)

Another administrative obstacle was an ongoing dispute between the *Inspector de Minas*, Joaquín Eizaguirre and the Cuban civil and military government, appointed in 1842. Eizaguirre was appointed inspector of mines on the island and claimed to have the right to inspect the entire islands of both Cuba and Puerto Rico. The civil and military government of Cuba contested this right. This Caribbean conflict seems to be the same as the one in Spain, where a dispute between administrative authorities and the mining engineers corps had remained unresolved since the early 1840s (Chastagnaret 2001). The civil authorities of Cuba contested the claims of the Ministry of Finances, which in 1842 had planned to end an exemption from taxes that favored copper mining companies (AHN Ultramar 77, Exp. 4).

A further obstacle that from the very beginning hindered the rapid growth of the coal mining economy in Cuba was a lack of infrastructure to transport the minerals from the mines. The easiest and shortest transport routes were usually from the mine directly to a harbor. But the condition of these routes was very poor and railway construction was in its infancy. In 1848, members of the Economic Society of Friends of the Country in Havana stated that the reason why workshops and factories to further process the coal were often concentrated at the same location was due to Cuba's deficient infrastructure. The effort and costs involved in transporting the coal were simply too high to disperse the various stages of production to more appropriate locations (Memoria 1848, 36).

Nevertheless, the economic and infrastructural environment for coal mining showed some positive features. The scarce historiography available underlines the fact that the few railways to be constructed in Cuba were developed mostly in dependence on the sugar industry. Michael Zeuske stresses that the first railway was used to transport sugar, and possibly also slaves, and to explore remote parts of the island (Zeuske 2012). The Catalan entrepreneur Miquel Biada i Bunyol, who had a close relationship with the governor Miguel Tacón y Rosique, promoted the construction of the first railway in Cuba, which after its inauguration in 1837 became the first railroad in a Spanish territory. After this success, Biada i Bunyo returned to Catalonia where he contributed to the first European-Spanish railway, which ran from Mataró to Barcelona (McDonogh 2009, 64). In 1854, Policarpo Cía mentioned in his geological report a railway from La Regla to Guanabacoa, which spanned a distance of around six kilometers (Cía 1854, 11). The importance of this facility for transporting people is shown, for instance, in the order that the governor issued to the railway company to waive the transportation fees for pupils of the Mechanical School of Havana (AHN Ultramar 30, Exp. 32).

An important copper mining industry had existed on the island since the late 1820s. Thanks to large amounts of invested capital, mostly of English origin, more than 30 copper mines were working in the region of Santiago de Cuba (AHN Ultramar 77, Exp. 4). The Spanish Cuban government granted concessions for mining for these foreign enterprises with an additional privilege that exempted them from export taxes for a duration of ten years. Shortly before this privilege was phased out, after an intense discussion between the Cuban government, the inspector of mines and the Spanish ministries of Ultramar and of Hacienda, the decision was made in 1842 to prolong the exemption for two more years. During this time, the copper mine owners were required to invest in copper furnaces in Cuba, which at that time were still very rare. Because of the investment capital from England and the tax-free export of crude copper ore, this material was shipped to Britain and smelted in the Swansea area. Thus, no proper copper industry developed on the Caribbean island, but once presumptive coal was found there, the Cuban authorities envisaged a next step in the industrialization process.

The Economic Development Related to Coal

From some of the archival sources, it can be read that great hopes were invested in the exploitation of coal mines. After Spain had lost most of its Latin American colonies, which the empire relied upon for natural resources, the recently discovered Cuban coal raised the shrinking transatlantic power's expectations for the future. The government and the enlightened forces on the island, still allied with Spain, hoped that the use of coal could help to stabilize the economic and political situations in Cuba. They were well aware of the increasing importance of using coal in heating, industry and transportation in many European countries. Coal mined in Cuba could diminish the dependence on transatlantic coal transports from northern Spain, or the import of coal from England or the United States.

The uses of coal were well known in Cuba. In 1841, the Mining Administration of Havana expected the exploiters of the coal mines in Cuba

[...] to adapt the exploitation if possible to a scale necessary for the different applications in craftsmanship, and the large consumption for navigation and even for domestic issues [...] (AHN Ultramar 14, Exp. 4)

As the correction of the results of the chemical analysis revealed, there was a lack of geological knowledge on the island. Between 1842 and 1844, the only known coal mine was La Prosperidad and although this mine had been exploited for around twelve years and had since been partly depleted, no further geological or mineralogical examination had been undertaken. Only in 1854 did the mining

engineer and geologist Policarpo Cía describe the deposit, situated only five miles from the center of Havana, as follows:

The mine Prosperidad, [...] presents the same qualities of combustible, even if in earlier times this was not believed. At that site, for the first time, the bituminous mineral had been shown to be constituted of quite homogenous layers and to be of some importance. (Cía 1854, 15)

Previously referring to La Prosperidad, Cía described bituminous deposits near the ancient coal mine:

Between Bacuranao and el Puente, two leagues east of Regla, near the route to that location, I was able to observe on crumbly terrain without stratification [...] a cut of 14 varas width ending on a bank of asphalt which in two cuts turned out to be one half and three-quarters of a meter thick. [...] There is no trace of stratification of that combustible at the beginning, but it is divided into different directions. With regard to its structure, this resource has two characteristics: one part is compact when fractured; united, homogenous and brilliant; reflects many circles of different diameter. When rubbed a bituminous smell can be perceived as well as electricity, which is evident. When put into contact with the fire of a heater plug, it starts to smelt and then catches fire. When put onto iron at a temperature of 130° it will also smelt entirely. Because of these characteristics, it thus becomes evident that this substance is asphalt and not bituminous lignite, as it was once believed to be. (Cía 1854, 14–15)

By the time Cía visited the site of La Prosperidad, the company that had founded the mine had dissolved ten years earlier.

A report from August 1844 (AHN Ultramar 77, Exp. 4) states that as a result of the small production rate of La Prosperidad, the enterprise of Prudencio Casamayor and Joaquín (de) Arrieta went bankrupt. The company's mining concession, obtained for extraction in 1832, was meant to bring other investments into this new economic sector. From the 1820s on, Casamayor was already engaged in the copper mining branch. Arrieta was one of the Spaniards who fled from Santo Domingo to Cuba during the wars of independent Haiti against the Spanish-dominated part of the island between 1822 and 1824. Casamayor founded a commercial business in Santiago de Cuba and in 1827 started his first copper mining business (AHN Ultramar 6, Exp. 7). At the end of the 1820s, Joaquín de Arrieta owned three mining businesses in the region of Santiago (Roldán de Montaud

2008, 362). These men first became associated with one another in 1830 when, in collaboration with other entrepreneurs, they founded a copper mining enterprise. Apparently, the capital used to set up that company was mostly of English origin for reasons mentioned above. But this Spanish-Cuban initiative became more autonomous from its English investors when it split from the Consolidated Copper Mines of Cobre Association in 1841 and founded the enterprise *Cubana Cobrera* (Roldán de Montaud 2008, 363–364).

All of this indicates that the entrepreneurs of *La Prosperidad* were in no way new to the mining industry, but part of a respected and influential group of mining entrepreneurs who began to defend their economic interests with political and administrative initiatives. They were in a much better economic and political situation than Ramon Villota and Juan Pujol, the founders of the carbon mine *La Prosperidad*, who are reported to have found the coal and initiated its exploitation (AHN Ultramar 14, Exp. 4, 7).

The company that ran *La Prosperidad* had asked the Cuban governor to act on its behalf in dealing with the Ministry of Overseas Affairs (*Ministerio de Gobernación de Ultramar*) and the Bureau of Mining in 1841. The aim was to obtain permission to increase its production. At the same time, the governor was asked to promote a tax increase on imported coal. Although the secretary and the Bureau of Mining were receptive to both propositions, the administration remained skeptical of the company's capability to produce enough coal to cover its consumption on the island at that time. As long as this was not proven, the Ministry of Overseas Affairs was reluctant to increase taxes on the import of coal (AHN Ultramar 12, Exp. 7).

The Environmental Implications of Coal Use in Cuba

In petitioning the Ministry of Overseas Affairs and the Bureau of Mining, the company highlighted the importance of coal consumption in the island. From the 1848 memorandum of an industrial exposition, held in 1847 at the seat of the Economic Society of Friends of the Country of *La Havana* and organized mainly by that organization, we are aware of a wide range of machines and engines in various sectors of industry that ran on coal. We also learned of forges in different towns in Cuba where coal was used. Some of them, or at least for some of the smelting processes, used pit coal. Others used the charcoal that was produced on the island. In an account published in 1866, the historian Jacobo de Pezuela gives some data regarding the production of charcoal in various places. In *Las Pozas*, 130,000 *sacos* (sacks) of charcoal were produced annually (Pezuela 1866). This represents around fifty tons of charcoal whose production would have required burning a quantity of timber ten times higher. Maybe *Las Pozas* was the largest of

Cuba's charcoal production sites, but it was not the only one mentioned by Pezuela in his dictionary on the geography, statistics and history of Cuba (Pezuela 1866). Some authors claimed that consumption of vast amounts of wood was detrimental to the island's environment and economy. The Cuban author and statesman, José Antonio Saco, who for many years lived in Europe after criticizing the Spanish government in Cuba, illustrated this relation between forest and economic development:

It is useless to evoke the necessity of forests for the construction of boats, buildings and other kinds of indispensables. Everyone is convinced that this is appropriate, but as long as the particular circumstances of Cuba have not been studied, the amount of efforts needed will remain unknown. Although the island is large, its territory is small compared to continental states; its population is small but is increasing fast; almost all of its riches come from agriculture, especially from the cultivation of sugar, which could not be produced without the use of combustibles. No coalmines have been discovered until now [...] It seems imperative to conserve the forests and to establish new ones in view of the smallness of its territory and its quick increase in population and agriculture, especially its peculiar character, the absence of combustible minerals and, above all, the need to constantly maintain substantial naval forces. If in brief nothing is done to avert this dangerous calamity, the day won't be far away that when constructing a house in Cuba the timber has to be solicited from foreign countries. In this, Cuba will become tributary and a miserable slave [...] Luckily, some efforts have been made to establish forests, but their scarcity is mostly felt by the *ingenios* [...] (Saco 1860, 45–46).

Some of the mechanical devices could be run on charcoal or even timber, but most of the engines imported from Europe and the United States needed a high proportion of mineral coal, which in some cases could be mixed with charcoal. The trains ran partly on coal, and were partly hauled by mules (Zanetti Lecuona and García Alvarez 1998). Pezuela mentions among other engines two dredgers working at the port of Havana (Pezuela 1871, 130). To fuel the mail boats, coals from Asturias and England were mixed together (AHN Ultramar, 434, Exp. 15). But the largest consumer of mineral coal would still have been the sugar industry, where a number of steam-engine driven machines were employed (Moreno Friginals 1964). Unfortunately, insufficient research has been done in this area to ascertain the number of steam engines on the island at the time or the amount of combustibles with which they were fed.

A Co-Evolutionary Relationship: Copper and Coal

The question of increasing taxes on imported coal mentioned earlier was related to the flourishing copper industry on the island. Copper mining and smelting in Cuba is another neglected issue in historical research, as Inés Roldán de Montaud stated some years ago. Most of the copper mines situated in the district of Santiago de Cuba were in the hands of English investors (AHN Ultramar 77, Exp. 4). In February 1833, the Spanish government issued the investors with a ten-year tax exemption for the export of crude copper. Furthermore, instead of paying 10% tax on processed copper, as was the case for colonial silver mining in New Spain, in Cuba copper entrepreneurs were charged only 5%. Thus it is not surprising that in 1836, one third of all imported copper in Great Britain (6,425 of a total of 19,466 tons) came from Cuba. The total output of Cuban copper mines doubled between 1833 and 1834, and Roldán estimates the output in 1845 at around 39,000 tons (Roldán de Montaud 2008).

Because of the investment capital from England and the tax-free export of crude copper ore, this material was shipped to Wales and smelted in the Swansea region—the so called “Copperopolis” (Hughes 2000; Miskell 2003; Newell 1990). In this domain, Cuban copper suffered the same fate as Chilean and Peruvian copper: at that early stage of global economies of resources, copper as a raw material was transported from all around the world to be smelted and processed in Wales. Thus, no proper copper industry was developed on the island (Roldán de Montaud 2008; Valenzuela 1992).

The issue of copper and coal became more relevant in the 1840s when the tax exemption was about to expire. Within ten years, as the data shows, copper mining had become an important economic factor in Cuba. Although the authorities hoped that this evolution would continue, even without the tax exemption, they still inquired as to how more stable capital investments could be secured for the copper mining industry. After months of discussions, the Ministry of Finance, the Ministry of Overseas Affairs and the Cuban government decided to extend the tax exemption for a further period of two years. Within these two years, the copper enterprises were expected to construct furnaces for smelting the copper ore. The Spanish-Cuban authorities were hoping to develop not only the mining sector itself, but related industrial branches as well such as the smelting and construction industries (AHN Ultramar 77, Exp. 4).

This administrative reasoning, leading finally to an economically motivated decision, was the primary reason why coal once again became a major issue for the island. In order to smelt the copper ore in Cuba, more coal was needed to supply the furnaces. But the English investors were having a hard time themselves and could barely cope with the political situation on the island. Reports dating from the beginning of the 1840s showed increasing xenophobia against

the British in the copper mining sector. At the same time, it was denied that the group managing La Prosperidad was at all dependent on English capital (AHN Ultramar 77. Exp. 4). This fear of foreign investment in the Cuban economy was by no means limited to the copper and coal mining business, but was also present in the tobacco industry as well. The employment of steam-driven machines for the processing of tobacco in England disturbed the finishers in Cuba. In future, they stated, instead of buying the finished tobacco product, the British should exclusively import raw tobacco and process it in British tobacco factories. This had devastating consequences for the Cuban tobacco industry, leading entrepreneurs to demand consistent sanctions. Both a technological advancement in Cuban tobacco production processes and a levy of export taxes for raw tobacco would be needed to protect domestic tobacco production (Memoria 1848, 38). One of the initiatives of the coal mining entrepreneurs was to demand from the Cuban government an increase in coal importation taxes. They also asked for a scientific survey from a Spanish engineer familiar with coal mining and for permission to extract a larger amount of coal than was originally agreed upon.

Other sectors of the Cuban economy prevailed. The sugar industry can be regarded as a catalyst for innovation when referring to technological means of production (Dye 1998, esp. 41–48; Edquist 1985). This was shown in the 1847 exposition, mentioned earlier, during which awards were given to outstanding products fabricated in Cuba (Memoria 1848, 5). One silver medal was granted to the School of Machinery, which had been founded by the Society. Under the supervision of their instructor, Pedro Teodoro Vaurigaud, pupils had constructed a turning lathe and various mechanisms for steam engines (Memoria 1848, 52), which could be employed in different sectors such as sugar refinement. In Havana, it seems to have been possible to work iron for such purposes as the construction of machines or machine parts or the amelioration of imported engines. At the port of La Regla, iron-smelting furnaces could be found, and the jury at the exposition expressed its desire to increase the production of iron —“the king of all metals”—on the island (Memoria 1848, 49).

Knowledge About Coal in a Colonial Environment

Knowledge About Coal in Cuba

There were several factors that hindered the development of coal-mining skills in Cuba. In 1844, the inspector of mines, Joaquín Eizaguirre, mentioned earlier, was asked by the Ministry of Overseas Affairs to choose an intelligent young man to whom he could teach his duties. The ministry claimed that this young apprentice would then assist Eizaguirre in his office. At that time, there were only limited op-

portunities for higher education and only a small number of professionals worked in institutions (Altshuler and Baracca 2014).

Félix Varela described this situation in 1814 in his work *Instituciones de filosofía ecléctica para uso de la juventud* (Gran 1945). But in the following decades, some initiatives related to the Economic Society were undertaken. A member of that society and secretary of the Section of Education, Alejandro Ramírez, who before coming to Cuba lived in Guatemala and Puerto Rico, asked for chairs in physics and chemistry to be founded at the University of Havana (Altshuler and Baracca 2014; Puig-Samper and Maldonado 2005). The authors of the memorandum of the 1847 exposition demanded better education opportunities on the island and especially insisted on the need for a chair in chemistry:

Sciences are like a torch that sheds its light on the workshops of industries in order to illuminate with its clear and brilliant light all its operations, and avoid any doubts, uncertainty and all awkward experiences of a simple routine. (Memoria 1848, 65)

This demand sheds light on the limited degree to which the Spanish authorities were willing to invest in an educational system on the island. It seems they were only willing to provide state-sponsored education to select individuals in the mother country. As the coal mining situation in Cuba became untenable, the Cuban authorities demanded that the Ministry of Ultramar send a second mining engineer to the island to assist the inspector of mines. The ministry, however, was reluctant to help and instead asked the inspector to find and train a new assistant on his own (AHN Ultramar 77, Exp. 4).

The lack of special training institutions was a common problem for colonial mining, and this had been the case in New Spain since the eighteenth-century. The Royal College of Mines in Mexico, founded only in 1792, was initiated, organized and headed by Fausto Elhuyar. He came to New Spain after studying at the Royal College of Mines in Almadén (Spain) and after having worked as an engineer in various royal mines around Spain. In New Spain, he promoted enlightened education and economic politics, and encouraged the institutionalizing process of engineer training. Previously, mining experts had been trained in the early modern style of transmitting knowledge through everyday practice (Sumozas García-Pardo 2007, 28–70). The Economic Society of Havana reported a similar situation in the silver industry on the island. The assayer (*ensayador*) of silver ore was not a trained chemist—as was the case in Europe’s silver mines—but a person who had learned his trade through practice (Memoria 1848, 47).

An education in geology, mineralogy or mining techniques was not available in Cuba and the possibilities of intercolonial student exchange, for instance with New Spain, were restricted by the government in Madrid. That possibility was

completely removed after Mexican independence. The last option left for Cubans to attain higher and specialized education was to send young men from the island to Europe to pursue their studies in Spain, England or France. Upon their return to Cuba, they would promote specialized studies, propagate their knowledge in publications printed either in the metropolis or in Havana and use their knowledge to benefit the national economy. There is a long list of men who, in the nineteenth century, upon completion of their studies in Europe returned to Cuba to engage in such activities. Among them are Félix Varela, Tomás Romay or Felipe Poey, who all travelled to Europe to study there. When they returned to Cuba, they became distinguished members of the small scientific community on the island. Alvaro Reynoso, for instance, after receiving his PhD in chemistry in Paris, brought the new agricultural methods of Justus Liebig to Cuba (Baracca 2014). His return to the island was part of a contract he had made with the Cuban government wherein the government awarded him a grant to pay for his education in Europe. In return, Reynoso was expected to become a teacher in the Cuban education system (AHN Ultramar. 20, Exp. 21).

Such contracts and the encouragement given to young men to leave the island for prolonged periods of time were supported by a handful of so-called enlightened Spaniards, who either came to Cuba on special governmental missions, such as Policarpo Cía, or because they held important positions in the colonial administration and government. Cía, who in 1854 published his important account on Cuban geology, had worked beforehand in the mining administration of Camagüey (then called Puerto Príncipe) from 1846 to 1850 (AHN Ultramar 19, Exp. 24), and made an inspection tour in 1851 before returning to Spain. Even some Catholic churchmen, such as Bishop Espada, would become promoters of enlightened education at the end of the eighteenth century (Cuevas 1990).

This Spanish-American exchange of knowledge was part of a broader network of exchange that comprised the European Academies of mining (Whitaker 1951), especially the German institutions (Hausberger 2009). The Spanish mine engineers traveled around Europe. German professors taught in Almadén and German engineers went in large numbers to New Spain and independent Mexico to teach at the Mexican Academy of Mining and to work in the globally renowned silver mines. To have seen the mines of Zacatecas or Taxco, Huancavelica or Potosí and to have had the opportunity to work in them and participate in engineering enterprises gave a great boost to the careers of the academics. The experiences made by European mining engineers in various parts of America could either last a lifetime or be limited to a few years. In the latter case, people such as Elhuyar or Cía became important figures in the European Spanish engineer community on their return to Europe.

The Cuban head of the mining department, Joaquín Eizaguirre, studied at the Spanish Academia de Minas in Almadén. He is clearly of Basque origin and maintained a network with other Basques in Cuba. After his time as inspector of mines in Cuba, which began in 1837 (Zamora y Coronado 1840, 477), he neither immediately returned to Spain nor did he engage in any teaching activities. Instead he worked in a private company, which began to build steam ships in Cuba in 1856, with fellow Basques, Antonio and Claudio Lopez and (his supposed cousin) Patricio Satrústegui (Echenagusía 2001; Rodrigo y Alharilla 2010). Only in 1852 did he become a *Negociado de Minas* in Spain and collaborate with the German mining engineer and geologist Guillermo Schulz (Llaneza and González-Pumariega 2005, 44).

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Even though silver and mercury mines were the foremost areas of interest for these engineers, in Spain some specialists were able to scientifically explore the existing coal mines. In his report on coal mining in Catalonia, Joseph Comes, the director of the Botanical Garden in Barcelona, speaks of different special survey missions to Catalan coal mines between 1768 and 1786. The Catalan Real Conferencia de Física completed the first study. Coal was extracted from one of the mines, Villa de Isona, then analyzed and compared to coal of English and Scottish origin. The health authorities of Barcelona demanded an analysis of coal in 1785. Finally, in 1786, the Catalanian Academy assigned the boards of chemistry and of natural history to examine two patterns extracted from recently discovered sites (Comes 1786, IX–X). In Spain, various economic societies promoted the idea of mining mineral coal and organized demonstrations that showed its utility to a broader public. These associations often demanded further geological and chemical surveys of deposits that had been well known since the end of the eighteenth century (Coll Martín and Sudrià i Triay 1987, 17–25). Some of the geologists surveying coal mines in Spain seem to be of German origin: Guillermo Schulz mostly worked on coal mines in Asturias and Galicia from the 1830s to the 1850s (Schulz 1858b; 1858a). Gabriel Heim published a report in 1861 on mines of the Chavitteau mining company at Quirós in Asturias (Heim 1861). Some of the capital investments made there were also of French origin, such as the *Compagnie Minière et Métallurgique des Asturies* or the *Société Houillère et Métallurgique des Asturies* (Rißmann 2003, 41). Other companies investing in Spanish coal mines came from Belgium (Coll Martín and Sudrià i Triay 1987, 198).

From a perspective of transfer and circulation of knowledge, Cuba and Cuban mining were still in a rather good position compared to the Philippines, the other remaining Spanish colonial territory. From the 1850s on, on different

islands of that archipelago and on Guam, an island that forms part of the Mariana Islands, coal deposits were found and declared. Nevertheless, the lack of knowledge was such that the owners and entrepreneurs could barely exploit them. A serious lack of geological and mining knowledge hindered the development of a new branch of colonial industries. The merchants who held licenses for exploitation asked the government in Madrid to send a mining engineer from Spain to help to develop the coal mining industry. In response, the Spanish government offered to lend the mine inspector in Manila, José Centeno y García, to the coal mining company. Although he was not an expert in coal mining, he must have been helpful to the company as they repeatedly asked for a prolongation of the lending-contract (AHN Ultramar, 434, Exp. 17). This episode shows that in the Philippines, even less than in Cuba, well-trained personnel for coal mining were available, but the geological knowledge was underdeveloped.

From the perspective of the mistakes made by de la Sagra, Taylor and Clemson, it can therefore be concluded that the case of *la Prosperidad* was no exception. The knowledge of experimentation with coal was still under development and the analyses they applied were more or less the standardized method of analyzing coal. The determination of a type of coal was carried out by its visual features, often combined with the analysis of its combustion properties. The knowledge these kinds of analyses relied on had been developed over centuries. The different and competing categories of description, and the designation and identification of types of coal, which the analysts in the colonies relied on, had evolved over a long period of time in different parts of Europe.

More sophisticated analyses were carried out in specialized chemical laboratories in Paris and Berlin. Only around 1830 were new methods for analyzing black coal used. These focused not on the amount of “coal,” but on oxygen, nitrogen, hydrogen and carbon, as reported by Carl Karstens in his *Untersuchungen über die kohligen Substanzen des Mineralreichs*:

The real nature of mineral coal and the reasons for its different behaviors, that is, not only the difference between lignite and black coal but even more among the different types of black coal, can only be shown when the ratio of carbon, hydrogen, oxygen and nitrogen is known. (Karsten 1826, 47)

Karsten, a mining expert and chemist, could refer to works by Antoine Laurent de Lavoisier who had discovered carbon and worked with hydrogen. Furthermore, Karsten combined these works with those of Carl Wilhelm Scheele and Joseph Priestley on oxygen. Thanks to Lavoisier and Henry Cavendish, he also knew about the conversion from water to gas, and vice versa. This knowledge was the

basis on which Karsten in 1826 was able to ascertain that it was not the amount of coal but the ratio of the above-mentioned substances that was crucial for identifying the quality of coal. The evolution of knowledge about the chemical analysis of coal did not end with Karsten's publication. He himself mentioned the difficulties involved in understanding the geological history of the composition of this carboniferous matter; he was also unable to explain why the different mechanical devices needed different kinds of coal (Karsten 1826, 78). Yet, Karsten was also unable to solve the main problem of geological prospecting: the composition of a coal-layer, he wrote, was on no account homogeneous. The results of a chemical analysis of one part of the deposit could produce a result that differed strongly from the analysis of other parts (Karsten 1826, 44–47).

Assuming that de la Sagra, or Taylor and Clemson had known the solutions Karsten proposed and possessed all the instruments needed to undertake these analyses, they may still have produced different results in 1828 and 1839. Karsten's specialized knowledge and the ability to implement it were limited to a small number of chemical laboratories in Europe, and neither Spain nor Cuba had direct access to them. Furthermore, de la Sagra, Taylor and Clemson made the common mistake of analyzing only one extract from the deposit rather than sampling more material, as de la Sagra did before publishing his *Histoire*. This confinement of scientific practice was something British geologists and scientists in the British colonial world experienced as well. News of the findings in Cuba spread almost immediately to British India, where only four years later de la Sagra published his results in the *Anales de ciencia, agricultura, comercio y artes*, the director of the Asiatic Society in Calcutta, James Prinsep, referred to them in a journal he published, *Journal of the Asiatic Society* (Prinsep 1832b, 366). Prinsep was very committed to encouraging the colonial government to exploit coal deposits in the Khasi-Hill region, today the state of Meghalaya (Watson 1834; Grout 1995). Thus, the results of the analyses of Cuban coal were also debated in the Cuban Spanish community and eventually shown to be wrong, the knowledge about this spread around the world in transcolonial form: it did not circulate via Europe or a European publication. Prinsep referred to de la Sagra by citing the Cuban journal as source of his knowledge. Thus, Prinsep was convinced by the data de la Sagra had published. Furthermore, in 1832, Prinsep himself published the results of a proto-chemical analysis of coal extracted from the Khasi-Hills and other Indian regions in the *Edinburgh New Philosophical Journal* (Prinsep 1832a, 347–349). The form of the table is reminiscent of those presented by de la Sagra. The difference between the results was that Prinsep's outcome fortunately depicted the quality of the matter extracted from the mines, whereas de la Sagra's results differed considerably from the rest of the sediment.

Conclusion

The issue of coal in Cuba, though a very short episode in history, has revealed transfer processes between English, Spanish, Catalan, Cuban, Mexican, US American and French actors. It has also revealed an even broader network of knowledge, which is less actor-related but rather constituted of books published from the late eighteenth to the mid-nineteenth centuries. The colonial situation for structuring these networks of knowledge transfer is of immediate importance, as Cuba was still a Spanish colony. Spain's weakened colonial domination would continue until 1898, when it lost the rest of its remaining overseas possessions. England was a colonizing state and communication was structured by this expansive engagement, which reached India. US colonial activities were first comprised of a continental expansion, with increasing overseas expansion taking place at the end of the nineteenth century.

The history of coal mining in Cuba is therefore a case of transcolonial transfer and adaptation processes. British and US American investors acted within the Spanish dominion. Spaniards and criollos, who had fled the war in Santo Domingo/Haiti, came from the former Spanish colonial territories; some had arrived from Spain to work as entrepreneurs or administrators. Cubans studied in Paris, London, Philadelphia and Madrid before applying their knowledge on their home island. The resource "coal," increasingly important in many branches of the industrialized production of goods, became an issue of concern, even in regions of the world where industrialization seemed to differ from the English model. This was the case in some parts of the European continent and in some of the British colonies, for instance, where an alternative method was used to produce goods for mass consumption (Bayly 2004).

The extent to which industrialization can be understood as a product of the transfer of knowledge is still an open question. Area studies have mostly been undertaken that have showed the advancement of the new production method and the changes in social composition and working conditions. This short case study on the history of coal mining in Cuba investigates local and regional differentiations and the interdependencies that occurred. Industrialization depended on factors such as changing patterns of consumption and production. It thus remains pivotal to any study of industrialization to consider the resources that were needed to industrialize processes of production and to produce newly demanded commodities. Furthermore, it is important to define in a certain context the role that knowledge of the resources and technologies played in developing new industries.

The Cuban case shows a process involving the both the experiences already made with coal as a resource and new developments, both intermingling with the idea of a local production of this mineral. In the social and political situation of

Cuba, local, colonial and foreign actors focused on coal for different reasons in different economic sectors, also in public administration. They searched for new possibilities to develop their finances or to create new economic systems; they also had to prospect for new ways of increasing knowledge. Thus, the rather short and limited experiences made with this carboniferous resource initiated processes of social, economic and political adaptation.

The short period of the local coal mining economy represents, for instance, a history of expansion of economic activities into the mining and transportation sectors. Coal in the Cuban economic situation of the first half of the nineteenth century also represented possibilities to substitute locally available organic combustible resources with either rare local timber or imported coal. Timber was a highly coveted resource in Cuba because an important shipbuilding industry existed there that claimed most of the high-quality timber. Converting timber into charcoal was quite ineffective, but some of the transportation facilities, *ingenios*, factories and forges used this organic material. Expectations for yields from the local production of coal were much lower than for imported coal, coming mostly from England. The ignorance of geological circumstances and chemical features encouraged ideas of economic development and this probably led to the different branches of Cuban economic and administration to keep a close watch on this new industry.

In focusing on these local examples, industrialization and the industrious revolution can be analyzed as part of a knowledge transfer processes, and not simply as part of a new developmental step of capitalism.

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Chapter 11

Epilogue: The Iberian Way into the Anthropocene

Helge Wendt

Why Combine the Anthropocene and Iberian Colonial History?

The debates in the historiographies dealing with knowledge and science in the Iberian world from the sixteenth to the nineteenth centuries are well known. They dominate most publications that seek to evaluate the status of cultural, colonial and epistemic differences. This volume offers a collection of heterogeneous case studies that respond to this tradition. In this Epilogue, I aim to develop an idea that in a way summarizes the results of the contributions. I propose the rather innovative approach of combining research in the history of the Anthropocene with the history of globalization of knowledge in the Iberian colonial world. The relatively new research of the Anthropocene investigates the current and very recent impact of human-caused transformations in the Earth's processes. It also considers the long-term consequences of human interference in natural processes in terms of millennia, focusing on changes that can be described and analyzed in different disciplines, such as geology, biology and climatology. Human impact on the planetary system can be accidental in the sense that the techniques used by some societies caused and continues to cause unintentional effects on natural systems. Some changes, however, are intentional, as, for instance, works in infrastructure, mining or deforestation.

This volume offers a perspective on the Anthropocene that researches more short-term historical developments. Concentrating on one special object of knowledge or on one person during a relatively short period of time, this method is closer to traditional historiography but can nevertheless illustrate an Iberian approach to the Anthropocene. Because the Anthropocene as a research field is still developing, this approach is useful since studying this field in history involves an investigation of historical and historiographical traditions of disciplines that now forms a part of the Anthropocene, which in turn can enrich historians' understanding of the human past. Likewise, this emerging but imposing research field is thus able to develop a more critical approach to the traditions it depends on.

To that effect, the present volume contributes a new perspective from the marginal countries of the Anthropocene epoch, not the usual perspectives from England, France, Germany and the United States. Research into the Anthropocene needs this approach from the so-called peripheries to avoid merely retelling the history of modernization and industrialization. Both the natural history and the history of knowledge of the Iberian colonial powers offer a multitude of alternative points of view for an understanding of the history and epoch of the term “Anthropocene.”

An explanation is required as to why the Iberian empires are situated rather at the peripheries of the Anthropocene epoch. The Iberian colonial system, based both in Europe and in the colonized domains, encompasses European and non-European types of proto-industrialization. For a long time it permitted both a unique type of communication and offers an example of engagement in economics by the state, which in its time could hardly be compared to systems of power in Europe and Asia. It is fair to say then that from the end of the fifteenth to the mid-eighteenth century, neither the Spanish nor the Portuguese power systems were situated at the periphery. Also, as Immanuel Wallerstein (1974) already argued in the 1970s, the European and overseas territories of the Spanish and Portuguese lie less on the margins when certain features of early capitalist production and commerce are taken into account. This “World System” perspective places the Iberian system at the periphery when compared to England, the Netherlands, certain areas of Germany and the United States during the eighteenth and nineteenth centuries, when considered in conjunction with the acceleration and streamlining of industrial processes and the accumulation of capital (Luca and Sabatini 2012, 20). It is at this point that a strong devaluation of the whole Iberian systems occurs: the Iberian countries are seen as only partly freed from medieval power structures, economy and thought. The dominance that the Catholic Church held in these countries severely slowed the modernization that might otherwise have been possible. Authors defending this point of view argue that industrial development did not occur in these countries (Bakewell and Holler 2010, 357).

Proto-Industrialization and Proto-Anthropocene

The problem with this analysis is that it is based on a system of evaluation that uses the political, economic and intellectual processes of northwestern Europe as its standard of modernization (Wehler 1975; Eisenstadt 2002). This is where studies of the historical evolution of the Anthropocene can offer a new interpretation of the histories of the Spanish and Portuguese colonial empires, as long as it avoids falling into conventional narratives of industrialization and modernization. Since

the Anthropocene era is normally related to the industrialization process rather than the pre-modern period, it is suggested here to focus on changes in production processes as one of the markers of the Anthropocene and to employ the term proto-Anthropocene in relation to processes that have been nominated firstly for the European historical context.

The term proto-Anthropocene pays tribute to a number of criticisms concerning the periodization of the Anthropocene. Jason W. Moore (2014), for instance, rejects the whole concept for various reasons: he sees a necessity of inclusion of the separated spheres of the human world and the natural environment, like research on social metabolism and any of the “old Green” movements, that the Anthropocene fails to realize. His favorite issue, the development of world capitalism during the early modern period, should be included in studies dealing with transformations of the natural environment because it is the logic of developing and expanding capitalism that has instigated those transformation processes since the beginning of the so-called long sixteenth century, starting around 1450. During this era, important processes began such as the industrialization and mechanization of production, which were less thoroughly examined by historians compared to the concept of capitalism. Transformations in energy supply systems (Weissenbacher 2009; Wrigley 2010) and the increasing standardization in production processes (Vries 1994) also play a role in defining a more inclusive and a *longue-durée* perspective on human-nature-transformation processes.

Another critical perspective toward the Anthropocene comes from archaeology. Archaeologists like Michael Balter (2013) argue that the human capacity for transforming nature on a large scale dates back to well before the beginning of the nineteenth century. The extinction of mammals by human action or the transformations of regions by agriculture are arguments that extend the period of the Anthropocene to before 1800.

The discussion of when the Anthropocene began evokes debates similar to those following the appearance of the first volume of Immanuel Wallerstein’s “The Modern World System” (Wallerstein 1974; Lippman Abu-Lughod 1995) or the debates on the beginnings of globalization (Bayly 2004; Gruzinski 2004; Osterhammel 2009). Those debates are characteristic for historiography but reduce this discipline to the function of chronicler. A way out of such debates is to create alternative chronologies. Bayly (2004) suggested distinguishing between archaic and proto-globalization, as well as the “modern world.” Beyond the possibility of rejecting the concept altogether, proto-Anthropocene suggests an enlargement of the perspective of human transformative action in its natural environment and the long history of relations between humans and nature. Besides an underlying chronicity, proto-Anthropocene emphasizes the long-term development of social behavior and cognitive models, as well as the historicity of

epistemological structures (Renn 2012), before the complete transformation from an agriculture-based society into an industrialized society.

Based on definitions of the Anthropocene, proto-Anthropocene encompasses a variety of different domains of human action. One domain includes the production modes, industry and the consumption of goods that led to a transformation of the Earth system. This complex domain is important to the Anthropocene, as these activities affect pollution and the extraction of natural resources from the environment. This point is elaborated in Helge Wendt's contribution to this volume. He looks at the short history of coal mining in early nineteenth-century Cuba. In the context of inner imperial and transcolonial exchange of knowledge, some actors in that episode created, out of the extraction of coal, the possibility to industrialize the island's economy.

Another factor of the Anthropocene is the "advancement of science." Knowledge deals directly with nature and natural phenomena and causes immediate human action. Geology, for instance, is directly related to the exploitation of minerals by mining.¹ Biology is associated with the use of plants for medicine,² agriculture or textile industries. Medicines can be prepared without Western biological scientific knowledge about plants, but some knowledge is needed to define which plants should be used.³ Thus, any form of knowledge about nature brings with it the exploitation of natural resources.⁴ The difference between proto-Anthropocene and Anthropocene lies in the dimension of the exploitation of natural resources and in the dimension of an all-encompassing use of knowledge to an economic end.

Diminishing Distances: Proto-Anthropocene and Cultures of Science

Will Steffen, Paul Crutzen, Jacques Grinevald and John McNeill describe the long duration of humans acting on natural processes and the development of knowledge connected with human actions:

The history of interactions between humans and the environment in which they were embedded goes back a very long way, to well before the emergence of fully modern humans to the times of their hominid ancestors. During virtually all of this time, encompassing a few million years, humans and their ancestors influenced their environment in many ways, but always by way of modification of

¹ See chapter 9 by N. Valverde.

² See chapter 2 by J. Pardo-Tomás, chapter 8 by M. Sánchez Menchero and chapter 6 by T. D. Walker.

³ See chapter 7 by A. Morales Sarabia.

⁴ See chapter 10 by H. Wendt.

natural ecosystems to gain advantage in gathering the vegetative food sources they required or in aiding the hunt for the animals they hunted. Their knowledge was likely gained by observation and trial-and-error, slowly becoming more effective at subtly modifying their environment but never able to fully transform the ecosystems around them. They certainly could not modify the chemical composition of the atmosphere or the oceans at the global level; that remarkable development would have to wait until the advent of the Industrial Revolution a few centuries ago. (Steffen, Grinevald, et al. 2011, 846)

Studies on the development of knowledge in the proto-Anthropocene concentrate on knowledge production and on social processes of altering “nature.” For these studies, any time limit seems futile when another important issue has to be solved: proto-Anthropocene as an analytic term has to prefigure in a more strict sense the time period it deals with. Proto-Anthropocene used in a more descriptive mode enables an adaptation to different historical contexts and more flexible employment. Thus, developments in the field of human-nature-interactions can happen to be placed in the Anthropocene and in the proto-Anthropocene synchronically.

The Iberian example is a good case for employing such a flexible notion of the proto-Anthropocene. When the industrialization and the capitalistic economy were already flourishing in some regions of the empire, other regions still showed features of a very small territorial market-oriented economy and small-scale craftsmanship (Lockhart and Schwartz 1997, 363–366). Both forms of economies were conjoined with state interventions in markets and economies to control and restrain private investments, and to collect the highest possible amount of taxes and capital (Bakewell 1971). Such forms of economic organization were partly established in the Spanish-American mining sector, where the Spanish Crown conceded licenses to mine silver, gold, mercury and other metals. In the Spanish-American mining sector, state investment of joint private capital, and capital profit coincided with the private interests of leading administrators as well as the necessities of political organization. Enormous numbers of workers migrated to work in the mines, water works were constructed and slag-heaps multiplied in the mining regions.

The concept of the proto-Anthropocene considers the developments in more or less capitalistically organized economies and unites them into a single mode of description. For instance, in the Iberian economies of knowledge, nature played an important role for institutions, epistemological traditions and possibilities of voyaging in the seventeenth and eighteenth centuries (Simões et.al. 2010), as Ana Simões, Ana Carneiro and Maria Paula Diogo have stated in reference to the situation in enlightened Portugal:

The knowledge of Nature, associated with the ideas of happiness and progress linked to the science-technology axis, was seen as a means for the exploitation of Nature and for the improvement of life. New technical practices developed, in particular, in the military, milling industry, sawing and draining. (Simões, Carneiro, and Diogo 1999, 8)

This refers to the point of scientific divide mentioned earlier. When dealing with the concept of Anthropocene and Proto-Anthropocene, we have to insist upon the fact that different knowledge economies have different ways of developing. In present debates, alternative ways of understanding the present situation are often ignored, as are alternative ways of dealing with problems related to climate change. It is therefore useful and necessary to reconsider different scientific traditions, including those that are either subsumed by Europeans or ignored because of the predominance of others.

Consciousness of the pre-eminence of the moderns over the ancients had more than one manifestation in the Iberian Peninsula. Unlike their Italian peers, local humanists were not easily dazzled by the virtues of Latin and other classical languages and consciously set out to develop their own vernaculars. The literatures on metallurgy, medicine, agriculture, surgery, meteorology, cosmography, cartography, navigation, and fortifications studied by Maravall are peppered with comments both on the ignorance of the ancients and on the technical superiority of the moderns. (Cañizares-Esguerra 2004, 89)

Cañizares-Esguerra shows that the workings of Iberian knowledge economies in the early modern period differed from Italian ones. Furthermore, knowledge production in the Iberian countries included not only idealistic but also very practical issues—the production of knowledge went hand in hand with the production of goods and consequently had far-reaching repercussions on the environment.

The understanding of the concept of Anthropocene as a process in which sustained human influence on the environment is irresolvable when combined with natural processes is therefore not necessarily tied only to the smoke stacks of Manchester, or other areas. The use of black coal, for instance, in the Iberian empires never attained the dimensions that it did in the British Empire. In the Iberian peninsula, coal was only used marginally in comparison to organic fuels. In the colonies, only a few sectors used coal, as was the case for the Cuban sugar industry in the first third of the nineteenth century. Equally, in the transport sector, a few steamboats were employed, but the large dockyards continued

to build sailing vessels from wood, and the mining industries continued to use charcoal and wood for fuel. In the colonies—even in the eighteenth century—no large-scale iron smelting industry had developed, nor did households start to heat with pit coal. These differences to the English industrialization process did not mean that there was no change in the production processes in the Spanish and Portuguese world. Here, a proto-industrialization evolved—also called domestic industry (Torrás 1998)—that is comparable to many other regions in Europe, America or Asia (Thomson 1996). Catalonia, for instance, had a long-term integration of its cotton industry into different markets (Martínez-Galarraga and Prat Sabartés 2013). In the eighteenth century, these developments relied less on fossil fuel than in the English production processes, but nevertheless had a lasting impact on the environment.

The question of whether or not the development of production in the Spanish colonies should be designated by proto-industrialization is open question. This very European concept is intended to describe changing patterns of production in the organization of labor, spaces of production in factories and in managing profits. This concept has only been hesitantly adapted to the Iberian colonial systems of production as some historians underline differences to the European context. The variety of organized human labor in the Americas, from slavery to non-capitalistic forms of free labor (Stern 1988), presents one argument against applying the concept of proto-industrialization to the Americas. Another argument is the different ways of achieving centralized places of production, as Bulmer Thomas (2014, 139–140) argues. He and other historians of economy consider the development in most of the regions of the Spanish and Portuguese Americas to be incomplete in comparison to the European model of proto-industrialization.

Comparable to the Latin American discussion about proto-industrialization, Indian historians of economy have asked whether this term and concept could be useful to Indian history. Abhay Kumar Singh (2006), for instance, argues that if proto-industrialization is applied to the economic and social history of the subcontinent, some important changes in the concept should be considered. In his study, he focuses on the process of changing production modes in Bengal and reasons to modify the concept in the sense that more regional variations of economic and social development can be considered to be of a “proto-industrial” nature. This perspective does not imply the transfer of an European historical concept to a non-European context, neither does it imply “reading” Indian history merely as an annex to European historical developments. Frank Perlin (1983) has argued that by adopting the concept, using European examples, it could even be used to explain some of the processes in pre-colonial Indian history.

As in the case for India, some historians of economy have argued in favor of a colonial and post-colonial proto-industrialization of some regions in Spanish

and Portuguese America, pointing to some important factors such as employment rates, circulation of money (Ouweneel and Bijleveld 1989), production modes and employment strategies.

The textile industry in Spanish America was, in the words of Manuel Miño Grijalva (1993), a factor of proto-industrialization. This branch of economy comprised as much the production of cotton as it did the production of fabrics and clothes. He states repeatedly that the way this industry was organized and integrated into the regional and transregional commercial networks confirmed its proto-industrial character. For the Brazilian case of textile home industry in the last decades of the eighteenth century, Douglas C. Libby (1997) employed and adapted the concept of proto-industrialization to the Minas Gerais case. He argues that during this time an important and independent household industry had developed that was very market-oriented and that profoundly changed the organization and division of labor.

Besides social-economic considerations, the impact that different branches of industry had on the environment could indicate the character of proto-industrialization. From an Anthropocene point of view, changing modes of production in the colonies often had a disastrous impact on the natural environment. Elinor G. Melville (1990) has shown how strong an effect the colonial Spanish proto-industry could have on the environment. After Spaniards had settled the Mezquital Valley to the north of the Mexican capital in the mid-sixteenth century, overstocking and thoughtless grazing of sheep had degraded the original vegetation leaving behind arid and deforested land. After only a few decades, Spanish proto-industrial agriculture had changed the biogeography and the biochemical processes in the Mezquital Valley forever (Melville 1990).

Yet another example is the use of mercury in the silver mining industry. Jason Moore (2003) for instance, addresses the relation between deforestation and Indigenous mining methods. When the quality of the mined silver ores decreased, an increasing amount of wood was needed to extract the silver. Now, new methods—stemming from Europe and employed by Europeans—which used mercury as the main agent in the silver extracting processes were employed, causing two kinds of change in the Peruvian silver industry. The first change consisted of the demotion of the Indigenous from master-processors to mere subworkers. A second change came about with extensive environmental damage caused by the mercury employed and by the higher demand for wood. Wood now was needed to extract the mercury from the ore at the Spanish mercury mines at Huancavelica (Peru) and Almadén (Spain) (Lockhart and Schwartz 1997, 149), and for separating the lethal mixture of silver and mercury once the extraction process was accomplished (Moore 2003). Thus, in order to extract a higher percentage of sil-

ver from the silver ore, the deforestation of some regions of the Andes continued and the new polluting process of amalgamation was introduced.

The Andean silver mining industry is furthermore a good indicator of Anthropocenic changes in environmental conditions, as a paper by Uglietti et al. (2015) points out. An important increase in mining related pollution of the atmosphere can be detected from ice-core analysis. This indicates a growing output of different air polluting elements resulting from expanding silver mining activities in the Andean region. The analysis of the Quelccaya North Dome ice core was able to detect lead, silver, bismuth, chromium, copper, molybdenum and antimony, increasing considerably with the beginning of Spanish colonial domination. Hylander and Meili (2003) argue that Spanish mercury mines have contributed to one third, and mines in the Americas to nearly one fourth of globally mined mercury. Cooke et al. (2013) underline the importance of the legacy of mercury deposits in some regions of the Andes where industries using mercury developed from the late pre-Columbian era. The analysis of Hg isotopes suggests that different uses of mercury, for amalgamation or for cinnabar mining, for instance, could have different effects on regional environments and societal evolution.

Furthermore, the expansion of the sugar industry has also been shown to be an example of the proto-Anthropocene process: environmental changes occurred through the expanding monoculture of sugarcane fields. Sugar exploitation in a proto-industrial style demanded significant energy expenditure, which was only possible through the use of slaves. Moreover, specialized technologies often stemming from other countries—such as the steam engine—were developed or adapted to the needs of the sugar production processes. Here, an increasing need for black coal arose, connecting the Spanish colonial sugar industries with the coal producing regions of England and North America (Fraginals 1978).

Lastly, in the Philippines during the Spanish colonial period, a huge population growth took place that went hand in hand with serious deforestation. In the vicinity of Spanish towns, mainly in the region of Manila, nearly all the surrounding forests had disappeared by the mid-nineteenth century. Contemporaries took this development seriously and urged the Spanish Crown to found the Royal Mountain Inspection Service. This helped to both realize projects of reforestation and convince the people in charge to study the fauna, botany and climate of the archipelago in more detail (Bankoff 2011). Thus, a co-evolution of degradation of nature, of scientific explanation and of action taken against the consequences of human induced devastation took place in, for instance, in the nineteenth-century Philippines.

This example of the Philippines confirms what Christophe Bonneuil and Jean-Baptiste Fressoz have recently stated:

Although only a first analysis, it is certain that modern people had their own forms of environmental reflexivity. It is persuasive, though truly confusing, to conclude that our ancestors destroyed the environment, knowing well the reason why. The industrialization and radical transformation of environments caused by pollution took place despite the environmental medicine, and the ever more intensive use of natural resources despite the concept of economy of nature and knowledge of their limited availability. The historical problem, then, is not of an emerging consciousness of environmentalism but rather the opposite: [it is about] understanding the schizophrenic nature of modernity which continues to envisage the human being as a product of the environment and at the same time allows him to change and destroy it. (Bonneuil and Fressoz 2013, 221)⁵

The evolution of *Anthropocenic* knowledge described and systematized the environmental changes in ever-higher numbers and in ever more detail. Scientists took into consideration that the changes were due to the impact of human behavior on the natural sphere, thereby allowing analysts to recognize just how related the human and non-human spheres of life were.

Some areas of proto-industrial developments are studied to determine how they relate to the generation and transfer of knowledge. This is the case for the proto-industrial production of silver, which used the amalgamation process. This process, using mercury as the main material for extracting the silver from the ore, was transferred from the context of the Hungarian-Austrian silver industry to the Americas. In Huancavelica, Potosí or Zacatecas, it profoundly changed the social order of mining and had devastating and long-lasting effects on the environment. This case differs from most of what is known about other early industrialization processes, where a disjunction between practice and theory reigns.

The Anthropocene and Its Legacy of “Scientific Colonialism”

Acquisition of Data in the Colonial World

The current project in the history of the Anthropocene deals with traces of knowledge, communication of knowledge, organization and systematization, as well as bodies of knowledge reaching back to the period of European colonialism. During the same era, which according to current understanding is when the Anthropocene began, an immense part of the world was under European colonial domination. During the colonial eras, from the fifteenth to the early twentieth centuries, data

⁵The translation is by the author.

was systematically collected in the name of scientific advancement, for better administrative control and for economic activities in a context of reduced contingency or, as it has been called, “economy of thinking” (Mach 1976 [1933]). But colonization exceeds the settings of the beginning of the Anthropocene. In order to connect the previous era with the later one, we must therefore use the related concept of proto-Anthropocene. Furthermore, this approach helps to investigate how certain features of the Anthropocene, which are taken for granted, developed over long periods of time and in different geographical areas. Nuria Valverde shows in her contribution to this volume, for instance, how the lack of a uniform approach to systematizing information in mining maps could lead to legal problems and finally compromise mining activities. But despite this lack of knowledge, making mining maps in the Spanish colonial context enhanced the abstraction of geographical and topological representations and provided new knowledge about nature and new possibilities for exploiting natural resources.

It was during the eighteenth century that data was collected in the French, British and Spanish colonies. This data was then compared, also to data collected in a much more contingent manner during previous decades. Data on temperature, for instance, stands in a long tradition of archiving climate-related information. The counting of population, which became less of a merely administrative and locally organized practice and evolved into the discipline called demography. Countries were now topologically, geographically and geologically measured, trees in forests were counted, meteorological occurrences were described and compared and conclusions were drawn. Globally important phenomena, such as the so-called Humboldt Current, oceanic warm water currents and wind systems could be observed. Migration movements of humans and animals around the globe were considered and provided an explanation for changing habitats and population patterns throughout the Earth’s history.

To a higher degree, this data relied on the opportunities provided by the colonial situation for the scientific exploratory voyages of, for instance, Louis Antoine Bougainville (1729–1811), James Cook (1728–1779) or George Forster (1754–1794). All of these exploratory voyages, which represent only one form of how knowledge could be gained in the colonial period, had an enormous impact on the European public and European scientific communities (Safier 2008). Their reports were published, translated and circulated, providing readers with exotic accounts of countries, people, flora and fauna. An interesting point of view depicted in these reports was that even presumably isolated groups of people were connected to sometimes, remote neighbors. The voyagers, who were often believed to be the original discoverers of knowledge, admitted that they often encountered already existing bodies of knowledge and ignored many more (Thomas 1991).

These scientific explorations of the eighteenth and nineteenth centuries belonged to a tradition of comparable Spanish and Portuguese voyages by Ferdinand Magellan (1480–1521) or Francisco Hernández.⁶ These provided proof that such enterprises were valuable for the expansion of European states. In a globally competitive economy of knowledge, the outcome represented additional goods, values and knowledge and were beneficial for transterritorial relationships. As José Pardo-Tomás points out in his contribution, voyages of scientific exploration were part of an economy of knowledge that was manifested in different social and cultural praxis.

The voyages had to gather large amounts of information. This they could only achieve by establishing access to innumerable informants and networks of circulating knowledge, as Angélica Morales Sarabia, Sonja Brentjes and Tim Walker mention in their contributions to this volume. Here we have another connection to times of high imperialism, the first half of the twentieth century when European colonizing countries needed so-called local or native expertise in order to establish systemized data collections. In any case, the center, where all information was not only gathered but also put into frameworks of interpretation considered scientifically valid, was mostly located in Europe. The interpretations varied and thus different competing systems of scientific encoded knowledge from the colonies circulated. This sometimes depended on national traditions of interpretation, the kind of information being circulated, the networks of knowledge, the importance one body of knowledge was given over another.

Systematizing Colonial Knowledge

Thus in the eighteenth century, a new aim of reducing the contingency of how knowledge was gathered arose, information was processed and interpretations were generated. More systematically organized systems to gather information were required and installed throughout the colonial empires. Starting with meteorological stations, data on temperature, rainfall, days of sun, and so forth, was collected, counted, measured and communicated to centers of data processing. Daniela Bleichmar (2009) gives the example of the botanist José Celestino Mutis, who lived and worked mostly in Bogotá. As many other botanists of that time, he and a great number of his colleagues collected data and objects on scientific voyages during the second half of the eighteenth century.⁷ She argues that botany and explorative voyages during that time had manifold functions: “they were concerned with economic botany, with political economy, with Linnaean taxonomy, and with visualizing the empire” (Bleichmar 2009, 446). Well-trained elites

⁶See chapter 2 by J. Pardo-Tomás.

⁷See also Lafuente and Valverde (2005).

established themselves in the colonies after studying at Spanish universities and executed the imperial task of data collection in several scientific fields (Berquist Soule 2014; Cabello Carro 2011). The same holds true for many of the eighteenth- and nineteenth-century British and French scientists who travelled throughout the colonial world measuring and quantifying while collecting data and objects (Bleichmar 2009). From that perspective, José Celestino Mutis remains in the same tradition of Louis Antoine Bougainville, Charles Darwin (1809–1892) or even David Livingstone (1813–1873), who all undertook explorations in different parts of the world with a comparable approach. Mauricio Sánchez Menchero in his book on Alzate and Bertolache has shown that in Mexico Creole erudite elites were able to gather the most advanced European knowledge in private libraries and make use of it by transforming it to Mexican medical practices (Sánchez Menchero 2012). Likewise, in his contribution, Sánchez Menchero identifies knowledge and objects from the colonies that were transformed and adapted for European demands.

The entanglement of theoretical and practical knowledge is part of this history: of proto-Anthropocene turning into the Anthropocene of industrialization. Historians of science have found some evidence of exchange between engineers and scientists in the early industrialization process, such as between John Smeaton (1724–1792) or James Watt (1736–1819) and the Royal Society (Buchanan 1985). During the late eighteenth century, all across Europe and in some of the European colonies, specialized schools, philanthropic societies and economic societies taught young men and experienced workers new technologies that made the exploitation of natural resources more effective (Harwood 2006). This can be considered as being part of an educational movement, producing several reformations of educational systems (Inkster 1980; Watts 1998) or as a reaction to the needs of increasing industrial activities (McLeod 1986; König 1998). Cross-European networks of education arose during these decades, and in Spain a similar movement emerged to those in England and in France.⁸

More than these personalities or single institutions, what really makes these colonial undertakings part of the Anthropocene are the long-term effects they have had on scientific outcomes. In addition to the images of men traveling the world under harsh conditions, which are still present in our collective memory today, scientists are still using what was brought back from the colonies to museums, universities and research laboratories in the Western metropolises. The educational institutions dealing with technology and its development often became parts of technical universities. Issues of scientific interest were formulated during the long colonial period and contributed to the formation of modern sci-

⁸See Anduaga (2011). For Spain, see Carbonell i Bravo (1805); Howe (1949); Llordén Miñambres (1994) and for England, see Foreman-Peck (2004); Inkster (1980).

ences, which today in turn contribute to the Anthropocene research and provide basic knowledge for how and where humans have exploited nature and natural resources.

Anthropocene and Global History: Integration of Different Knowledge Cultures

The long prehistory of the concept of Anthropocene and its issues and goals directly connect to global history issues such as dealing with different cultural systems and intercultural spheres, taking a *longue-durée* perspective and coming to concise conclusions, despite a diversity of facts. When a historical perspective was added to the concept, Will Steffen and some of his colleagues argued that the Anthropocene had every capacity to play an important role in new global history writing (Steffen, Crutzen, and McNeill 2007). They argued that the Anthropocene was not confined to the Western world.

World history is not just about past connections in the human community, any more than it is about Earth systems independent of people. In the geological epoch of the Anthropocene, it must be about ‘humans and the rest of nature’ taken together at scales appropriate to the questions of history. (Robin and Steffen 2007, 1712)

This large-scale history responds to approaches to history writings that narrate the history of humankind from its beginning as a culture producing species in so-called prehistory up until the very recent past. This kind of narrative is often organized by phases or steps in sociopolitical development from the agrarian societies, skipping over more complex formations of supra-local forms of organization to empires and modern nation states (von Sivers, Desnoyers, and Stow 2012). Stages of development, mostly from a non-evolutionary perspective, also helped to structure global history. World history writings standing in the tradition of universal history act on the assumption of stable concepts in history writing, such as, for instance, modernity (von Sivers, Desnoyers, and Stow 2012, 1017).

Another example of how period-based ordering of larger timescales can be managed is given by Christopher A. Bayly (2004), who proposed an order for the history of globalization of the last three hundred years, passing from an ‘archaic globalization’ to a ‘modern globalization.’ Bayly intended to make global history intelligible by giving it a structure of time, not by merging any aspect of the histories he dealt with into one single interpretative scheme. Thus, there is a challenge in global history writing and any other enterprise dealing with broad subjects and large periods of time, and with a large variety of issues from different historical backgrounds.

In contributing to such a debate, there is an urgent need to consider non-European data to understand what the Anthropocene aims for: historical narratives that not only serve to clarify the human past but also shed light on the ways humans have developed in responding to environmental challenges. Such insights might help humans to generate new forms of living in the future when the global climate change will have a stronger impact on human forms of organization.

Anthropocene From a Global History Perspective

In this context, the above-mentioned questions of intercultural exchange also return in debates surrounding the Anthropocene. One string of research will further investigate questions of cultural foreign data, of exploitation and expropriation, of misunderstanding or ignorance. Changing the perspective opens up the possibility to study processes of exchange and the incorporation of knowledge that was, for instance, of non-Iberian origin but that had gained a certain importance in some fields of Iberian or European knowledge systems. Knowledge about plants, social organization, religion and mining were reinterpreted and transformed in the Iberian context in the frame of colonial sciences, where the reconfiguration of bodies of knowledge constantly took place. Anthropocene here means to acknowledge these often asymmetrical exchanges of knowledge and the fact that foreign data has a place in the steadily evolving systematizations of Iberian and European knowledge. An Anthropocenic approach also encourages a closer look at how these processes were organized, which people took part, what kind of outcomes they produced, which long-term consequences they had and how new studies can proceed to frame intercultural processes of knowledge exchange in the future. This responds to the observation that these types of processes may provide assumptions and general conclusions with more detailed knowledge. Furthermore, local non-Western scientific knowledge can make available a more complex perspective on developments in the Anthropocene. Thus, the Anthropocene can help to diminish the divide between different scientific cultures. It has the potential to encourage acceptance and the acknowledgement of data from other scientific backgrounds. And finally, the Anthropocene might create a perspective in historiography that is more conscious of its own traditions.

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