

HISTORY

Objects and Agency: Science and Technology Studies, Latin American Studies, and Global Histories of Knowledge in the Early Modern World

Hugh Cagle

University of Utah, US

hughcagle@gmail.com

Drawing from a combination of the author's own research on Portugal's empire and recent work across a range of disciplines, this essay discusses the growing dialogue between Latin American studies and science and technology studies (STS). It discusses key similarities and differences in the questions, methods, and theoretical frameworks which have guided research in both areas. It focuses particular attention on the divergent ways in which the two interdisciplinary arenas of scholarship have handled objects and materiality. The author argues that despite important differences in orientation, a focus on objects and materiality informed by STS perspectives can broaden the archive available to scholars of colonial Latin America, challenge and extend critical insights of colonial research, and call into question the adequacy of conventional Latin American and Atlantic spatial frameworks.

Baseando-se numa combinação das pesquisas do próprio autor com trabalhos recentes de temas variados, o presente artigo trata do diálogo crescente entre Estudos Latinoamericanos e Estudos de Ciência e Tecnologia (STS). O artigo aborda semelhanças e diferenças centrais nas questões, métodos e estruturas teóricas que até então têm guiado investigações nos campos de Estudos Latinoamericanos e STS. Ele foca particularmente nas diferentes formas que os dois âmbitos interdisciplinares de pesquisa tratam objetos e materialidade. O autor argumenta que apesar das diferentes orientações dessas duas áreas, o foco em objetos e as suas materialidades, baseado nas perspectivas do STS, permite uma ampliação do arquivo disponível aos que investigam a América Latina colonial, desafia e expande o pensamento crítico desse campo e incentiva novos questionamentos sobre o uso de conceitos espaciais convencionais da América Latina e do Atlântico que vêm sendo utilizados por pesquisadores do tema.

How can studies of science and technology enrich our accounts of colonial Latin America? Over the past twenty years, as Latin American studies specialists have become more attuned to the intellectual sophistication and technical expertise of subaltern actors in the colonial period, specialists within science and technology studies (STS) have struggled to account for the asymmetries of power that shape colonial archives and definitions of scientific knowledge.¹ At the same time, while work in science and technology studies has often struggled to engage questions of power and human exploitation, work in Latin American studies has often struggled to incorporate interpretive approaches that look beyond them. Yet area studies and science studies scholarship are increasingly engaged with one another. In what follows, I explore the growing convergence of—and persistent tensions between—these two approaches to Latin America's colonial past.

Drawing on a combination of my own research, STS scholarship, and work by specialists of Latin America and the Atlantic world from across a range of disciplines (including history, art history, anthropology, history and sociology of science, and literary and cultural studies), I highlight some of the ways in which insights drawn from STS challenge, enrich, and extend the questions and interpretations current among scholars

¹ On what is meant by STS and how the field has taken shape in recent decades, see Dear and Jasanoff (2010).

of the Latin American past. I begin by briefly tracing what I see as an expanding dialogue between Latin American studies and STS, highlighting common ground before drawing attention to some of the divergent ways in which the two interdisciplinary arenas of scholarship have constructed their domains of study. In particular, I draw attention to the ways in which material objects, while integral to both approaches, have nevertheless been handled quite differently. I suggest that renewed attention to objects and their movement across imperial lines and epistemological categories can shed new light on knowledge production in colonial Latin America and beyond. I then focus on three lines of inquiry. The first follows a little-known epistolary exchange between the kings of Kongo and Portugal on the subject of unicorn horns in order to address the relationship between material objects and the constitution of early modern empires. The second line of inquiry concerns the ways in which object-oriented studies might be used to broaden current conceptualizations of subaltern knowledge, agency, and indigenous intellectuals, while also challenging arguments for alterity and incommensurability. This section links the foundational work of Ángel Rama on colonial literacy to recent scholarship on the Iberian Atlantic. A third line of inquiry concludes the essay by suggesting ways in which a focus on objects, expertise, and circulation can more thoroughly integrate scholarship on Latin America and the Atlantic world within a global frame, helping to establish stronger connections between world regions too often cleaved apart by area studies and oceanic world frameworks.

Objects of Inquiry

The concerns of Latin American studies and STS have long overlapped in important and productive ways. Scholars have shown how the region's colonial past has been foundational for modern disciplinary formations (e.g., Pagden 1982) and have critically traced the ways in which medical and scientific institutions and expertise took shape in the postcolonial period (Stepan 1976; Cueto 2007). They have stressed the ways in which the natural, medical, and social sciences have continued to help install, legitimate, and perpetuate inequalities (Pletsch 1981; Stepan 1992; Espinosa 2009). And they have highlighted the ways that indigenous, subaltern, and other groups have variously engaged with shifting regimes of political, economic, intellectual, and technical organization (Soto Laveaga 2009; Roberts 2012; de la Cadena 2015; Briggs and Mantini-Briggs 2016). The scope of engagement between Latin American studies and STS has been particularly marked in recent years. Both the International Society for the History, Philosophy, and Social Studies of Biology and the International Congress of History of Science and Technology held their meetings in Latin America for the first time in 2017, in São Paulo and Rio de Janeiro, respectively. For the first time ever, a Latin American city is to host the annual meeting of the History of Science Society, which will hold its 2021 convention in Mérida, Mexico. Meanwhile new institutional arrangements are taking shape. There is currently a movement to create a standing Latin America interest group within the History of Science Society (an effort partly influenced by a similar group already established for Asia). And a new interdisciplinary scholarly journal, *Tapuya*, has come into being with an expressed focus on STS within and about Latin America.²

The most salient area of colonial research is particularly recent and entails new convergences between Latin American studies and STS. Over the past two decades, as part of a critique of the conventional narrative of a scientific revolution within Europe, a growing body of scholarship has drawn attention to the role of the Iberian colonial world in the fashioning of modern ontologies and modern epistemologies. Foundational in this effort was the 2001 book *How to Write the History of the New World*, in which historian of science Jorge Cañizares-Esguerra argued that modern notions of authority and credibility associated with the eighteenth-century northern European Enlightenment were actually pioneered and vigorously promoted in metropolitan Spain (where they were fashioned to support revisionist accounts of the history and character of native peoples of the Americas) (Cañizares-Esguerra 2001). In 2004, in an article meant to bring to light decades of Spanish and Portuguese scholarship that had long been sidelined in the heavily Anglophone science studies scholarship, Cañizares-Esguerra pointedly asked “how much longer” Spanish and Portuguese contributions to the scientific revolution would be ignored by both mainstream studies of science and technology, as well as by students of the early modern Iberian world (Cañizares-Esguerra 2004). Meanwhile conversations between William Eamon, Victor Navarro Brotos, and other scholars—mainly trained in universities in Europe and the Americas in the fields of history, history of science, and art history—were under way. These led to a formative conference in Valencia in 2005 and then to a dual-language (Spanish and English) volume titled *Más allá de la Leyenda Negra: Spain and the Scientific Revolution* (Navarro

² I am here concerned with the institutional infrastructure of Latin American studies within US and European academies. Within Latin America, the situation is rather different. The Fundação Oswaldo Cruz, for example, has supported the publication of *História, Ciência, Saúde—Manguinhos* since 1994 and it has been available online since 1998.

Brotons and Eamon 2007). These interventions helped propel a more concerted engagement between Latin American studies and STS that focused heavily on Iberian colonies in the Americas between the sixteenth and eighteenth centuries. Under the unifying rubric of “Iberian science,” scholars of Spain, Portugal, and Latin America from a number of disciplinary backgrounds turned to science topics that ranged widely from cosmography and imperial bioprospecting to systematics and human-animal interaction (Bleichmar et al. 2009; Few and Tortorici 2013).

Yet if the calls of Iberian science specialists represented a challenge to scholars of both Europe and Latin America to reinsert the Iberian world back into the narrative of the scientific revolution, it also marked a departure from currents within STS itself. While Iberian science studies had begun to demonstrate the ways in which the roots of modernity lay in the Iberian peninsular and colonial pasts, many specialists of early modern science within Europe had begun leveling a critique of the very notion of a scientific revolution. They argued that the sciences were, and remain, disciplines whose facts are at least as socially constructed as they are mechanically produced, and that what have often been taken as its characteristic methods—such as empiricism and experimentation—should be understood as diverse and contested, and as having never achieved the rapid and widespread ascendance once thought to constitute a revolution in conceptions of the natural world and in the production of knowledge about that world. Hence, while a leading figure of seventeenth-century science studies, Steven Shapin, famously opened a book titled *The Scientific Revolution* with the provocative claim that “there was no such thing as the Scientific Revolution” (Shapin 1996, 1), outspoken advocates of Iberian colonial science had begun to argue that there was indeed such a revolution but that it first took place in Spain and its colonies.

Much science studies scholarship, on one hand, and scholarship on Iberian science, on the other, seemed to be moving in contradictory directions. More recently, Iberian science scholars, including Cañizares-Esguerra himself, have begun to reflect critically on the Eurocentric, progressivist, and elitist influences that guided the earliest formulations of Iberian science (focused as they were on well-to-do, cosmopolitan, male savants) (e.g., Pimentel and Pardo-Tomás 2017; Slater and López-Terrada 2017). Scholarship has continued to highlight the ways in which Spanish and Portuguese colonial inhabitants vitally participated in the intellectual, acquisitive, and investigative practices that would help define the new science of the seventeenth and eighteenth centuries (e.g., Safier 2008; Bleichmar 2012). But the scientific revolution as an organizing concept has increasingly been either critiqued or simply jettisoned. Studies have revealed instead not simply the genesis of epistemic practices that are now understood as formative of modernity, but an array of diverse approaches to natural inquiry and the nonhuman world. They have identified previously unacknowledged sites of investigative activity—mines and plantations among them—and have begun to draw attention to the foundational contributions of subaltern subjects to colonial intellectual, investigative, and medical endeavors (e.g., Mundy 1996; Sweet 2011; Candiani 2014; Few 2015; Bigelow 2016). Increasingly, Latin America’s colonial past appears as part of the broader history of the sometimes disparate, often innovative, and always partially improvised investigative efforts which are now understood to have pervaded the early modern world.

Yet the initial difference between an Iberian science approach invested in recovering a past that had been erased from the origins story of modernity and a science studies approach that interrogates the origins story itself is emblematic of a deeper rift between the two domains of inquiry. A concern for multiple forms of dispossession, marginality, and erasure are integral to both Latin American studies and STS. The two areas of scholarship have in common a skepticism of conventional narratives of scientific development. And they increasingly share perspectives that deprioritize long-standing and still-normative Euro-American definitions of science and technology. But they often embrace fundamentally different views of what kinds of occlusions and omissions are most important. Latin Americanists have most often privileged historically marginalized persons and perspectives, and have tended to engage questions of historical or historiographical dispossession in one of two ways. The first draws inspiration from critiques of global capitalism initially articulated from within a world-systems or dependency framework; the second builds on cultural theory and places emphasis on redressing forms of epistemic violence—erasures perpetuated by reliance on historical sources (overwhelmingly alphabetic and textual) often produced within Western imperial and colonial institutions and according to prevailing Western discursive conventions. Both sets of approaches surely reflect the commitment to emancipatory politics that has remained central to Latin American studies since at least the 1960s. That commitment continues to drive—and to connect—scholarship and activism concerning the region. So, for example, when Raoni Rajão and Sandra Harding penned their introductory essay to the inaugural issue of the journal *Tapuya*, it was in precisely these ways—by turns Marxian and Foucauldian—that they understood marginality and violence (Rajão and Harding 2018). Similarly, it is as registers of material and cultural inequality, exploitation, and contestation that a great deal of foundational

scholarship in Latin American studies has often approached the production and circulation of objects (Ortiz 1947; Stein 1958; Mintz 1985; Bauer 2001).

By contrast, from an array of more object-oriented STS perspectives, human erasures figure as but one kind among many. Scholars building on actor-network theory and a number of more recent approaches that have emerged in dialogue with it are less concerned with asymmetries of power among human subjects alone and instead emphasize those among humans and nonhumans. In their contributions to a critique of the positivist and universalist pretensions of modern science and the nature/culture opposition that underwrites it, these STS scholars are inclined not only to stress the cultural specificity of knowledge and the location of epistemic practices (Seth 2009; Roberts 2009) and to take seriously the transformations of knowledge and technologies as they move (Anderson and Adams 2007; Raj 2013)—all of which resonate with scholarship on Latin America—but also and especially to draw attention to the agentive possibilities of nonhumans (Wolfe 2009; Coole and Frost 2010; Holbraad and Pedersen 2017). Some of the most influential critiques of the conventional scientific revolution narrative centered on such possibilities, and they have remained the subject of intense debate (Latour 1993; Bijker et al. 2012). While “nonhuman” is a capacious category, here I focus on material objects. And while the most forceful claims for the agency of nonhumans have provoked considerable controversy (Sayes 2014), I want simply to stress that object-oriented STS scholarship takes the position that discourse alone cannot fully account for the operations and influence that objects have on human affairs. It emphasizes the ways in which humans and objects operate in concert with one another—each an element in a larger assemblage—such that science, technology, and society (nature and culture) are mutually constitutive (e.g., Jasanoff 2004).

From an object-oriented science studies perspective, power and belief alike hinge on the marginalization or obfuscation of the operation of humans and objects together, and on the networks that link them and enable that operation. Hence, much recent work in STS is concerned with retracing those relationships, revealing the interdependence of humans and nonhumans, and tracing the ways in which that very distinction (nonhuman/human, nature/culture) gets drawn in the first place. Not only can this approach deprioritize humans and their agency, but it can seek to actively marginalize them (e.g., Bennett 2010; Bogost 2012).

How might one reconcile the humanist commitments of Latin American studies with the object-oriented priorities and more expansive view of agency that suffuse much work in STS? While the two areas of study may at first appear at odds, the object-oriented perspective of the latter is actually consonant with the research priorities and political commitments that help propel the former. A renewed attention to objects and their materiality that incorporates STS insights can challenge conventional accounts of colonial Latin America in a number of ways. Focusing on the cultural specificity of objects, their production, and their varied meanings can highlight the ways in which technology both did and did not help stitch together Iberian empires. It can bring into view forms of expertise and intellectual sophistication often obscured in colonial studies that emphasize graphic literacy (in any form) as the paramount attribute of such sophistication. It can help call into question long-standing arguments for colonial cultural alterity and can instead point to possibilities for epistemic and ontological commensurability. And because objects are conceived as embedded in larger assemblages, they can be interpreted so as to highlight historical spatialities that transcend the boundaries of both the Latin American and more expansive Atlantic world frameworks that presently dominate scholarship across disciplines.

Knowledge, Technology, and Narratives of Domination

In some of the most influential studies on the constitution of colonial rule, knowledge and technology have figured primarily as instruments of power, as determinative of the outcomes of cross-cultural encounters, and as the driving force behind the creation of Iberian empire states. Hence John Law (1986) argued that the creation, combination, and deployment of the transportation and navigational technologies that carried fifteenth-century sailors to Africa, Asia, and the Americas were both causes and consequences of the expansion of the Portuguese state. Alfred Crosby's (1986) widely read account of the environmental factors that contributed to Spanish colonization of the Americas entailed not only such things as portmanteau biota (for example, the smallpox virus) but also technologies large and small—from sailing ships to fence posts and hog yokes. According to Tzvetan Todorov (1984), the Spaniards' superior ability to read nature's signs and manipulate its powers gave them the technological advantage that determined the outcome of the contest between Cortés and Moctezuma. Camilla Townsend has more recently taken aim at such essentialist renderings, highlighting instead the Mexica leader's savvy maneuvering in response to the coming of the Spaniards. And yet, Townsend concedes, the Spaniards' superior technology still made all

the difference: “it was inevitable that Cortés and his men—or some other soon-to-follow expedition—would conquer the Aztecs. They had the technological advantage” (Townsend 2003, 673). As with expansion, so too with recession: David Goodman (1988) argued that financial and administrative limitations on natural inquiry and technological development ultimately undermined Spanish imperial power under Philip II. Michael Pearson, a historian of Portugal’s empire in Asia, pointedly drew out the implications of what so many scholars have seen as the yawning epistemic and technological divide between early modern Europeans and their contemporaries. “The beginning of European superiority” and hence “the rise of the West” and “the creation of the Third World” are visible in such contests (Pearson 1995, 141).

Although these histories descend from particular disciplinary and theoretical orientations (sociology, history, literary criticism), and although they have distinct regional and archival emphases (the Iberian Atlantic and Portuguese Asia), they all share a narrative that culminates in conquest and domination. For all the strengths of this literature, the explorations of the cultural, intellectual, and material entanglements of colonialism have tended to leave aside contingency when it comes to thorny questions of the place of knowledge and technology.

How can knowledge and technology be made part of imperial and colonial histories without determining their outcomes (even as we now know that political, economic, and cultural asymmetries were indeed the eventual consequences)? As Marcy Norton (2017) has compellingly shown, the creation of Iberian empires hinged not only on ways of knowing and forms of practice exported from Europe to its colonies but on disparate, overlapping, and increasingly entangled ways of knowing and doing drawn from both Africa and the Americas. Although Norton was concerned with what she described as “subaltern technologies,” her argument—that a more plural and less Eurocentric vision of what technology was and who possessed it can shed light on little-known or misunderstood aspects of Iberian colonialism—holds as well for relationships between early modern states and imperial rulers. Exchanges of knowledge and technology not only sustained colonial societies; they characterized the creation of empires at all levels. And just as attention to the cultural specificity of subaltern technologies can highlight the ambiguities of authority in particular colonial settings, tracing material and technological exchanges among imperial rulers can help reveal the limits of imperial power.

A window into this aspect of the early modern Iberian world comes to light in an exchange of letters in the late 1520s between rulers of the kingdoms of Kongo and Portugal. On October 18, 1526, Mvemba a Nzinga, Dom Afonso I of Kongo, wrote from Mbanza Kongo (São Salvador) to Dom João III of the tribulations then plaguing his realm. The letter was short but pointed. The lengthy formalities that opened the letter quickly gave way to an image of disease and desperation. “Many and diverse infirmities,” wrote Dom Afonso, have made the kingdom “weak and extremely vulnerable.” The king went on. “Our children, parents, and unmarried subjects,” he stressed, “have no physicians, nor surgeons who know how to treat these afflictions with true remedies, nor are there apothecaries here nor medicines by which [our subjects] might better treat them [by themselves]” (Brásio 1952, 1:488).

The missive moved quickly from ill health to imperiled faith. “And it is in such a vulnerable state as this,” Dom Afonso continued, “that many who are already confirmed and taught in the holy faith of our Lord Jesus Christ suffer and die.” As for “the other people” of the kingdom, they “for the most part cure themselves with herbs and powders and in other ways [as they have done] since antiquity.” As a consequence, “those who live put all of their faith in said herbs and ceremonies, and . . . go about as if they too have been saved [*vão salvos*],” which the author pointed out, “is but little service to God.” Then came the request from one Christian prince, one “brother,” to another. Dom Afonso asked Dom João to send to the Kingdom of Kongo “two physicians, two apothecaries, and one surgeon . . . with their medicines and other necessary things,” because, “for every single one of them we have an extreme necessity” (Brásio 1952, 1:489).

At first reading, the meaning of the letter seems clear enough. Facing an epidemiological emergency that threatened the health and life of his subjects—and possessed of a strong diplomatic and cultural relationship with the kingdom of Portugal (Afonso I was instrumental in the development of an African Catholic Church in Kongo in these years [Thornton 1984])—the Kongo king sought to acquire what he believed were the more efficacious, “true” remedies of his Portuguese coreligionists and the coterie of experts who knew best how to apply them. Physicians, apothecaries, and surgeons would not only more effectively attend to the medical needs of Kongo’s Christian subjects but in doing so would also, he implied, demonstrate the power of Christians and their god.

Such a reading would square well with what we know about how the Portuguese and many other Europeans had begun to conceive of their own technical achievements. And it would be easy to construct a rationale for that interpretation from Dom Afonso’s point of view. With ships at sea and specially rigged

sails, with compasses and astrolabes and charts, these bearded, pale-skinned bearers of an unfamiliar faith brought the powers of ships, winds, currents, and stars into alignment so as to take them where they willed. Perhaps they did indeed know something more about harnessing nature's powers than the healers of Kongo.

The incipient asymmetry of European colonial relationships identified by Pearson in the sixteenth century appears even more convincing given that the Kongo ruler's 1526 letter was one in a succession of similar letters dating to the 1510s, in which Dom Afonso complained of the merchandise flooding into his kingdom and eroding his control over the patronage networks that underwrote his authority. Indeed Afonso I pressed for the elimination of excess trade goods in this letter asking for medical professionals from Portugal (Brásio 1952, 1:489–490).

Of course, distinguishing here between rhetoric and the situation in Kongo at the time is tricky, and there is certainly no reason to doubt that the kingdom was in the throes of an epidemic. Nor is there any reason to doubt the sincerity of Dom Afonso's desire to have Portuguese physicians and other medical specialists in his realm. But there is good reason not to take at face value the suggestion of medical and spiritual primacy that would seem to portend encroaching Iberian influence. When it came to curative expertise among sub-Saharan African communities, and the relationships that took shape between them and Portuguese and other European settlers, Judith Carney and Richard Rosomoff (2009) and others (e.g., Kananaja 2015) have documented a centuries-long pattern to show that the opposite was more nearly the case. In settlements along the West African coast and southward, resident Europeans depended on the botanical and curative knowledge of the people, very often the women, whom they met there, in order to survive the pervasive fevers and dysenteries.

The value in having Christian physicians more likely derived from other considerations, especially an interest in keeping the European Catholic priests (then in residence) alive. While relations between Afonso I and European clerics were quite good, the matter required constant attention and, after Dom Afonso's death, relations began to deteriorate. Eventually Kongo relied on its own native clergy. But at the time, these priests were seminal to the creation of Catholicism in Afonso's dominions, through which Afonso I derived a number of advantages. From the Kongo ruler's perspective, these priests were crucial facilitators of diplomatic and commercial links with the Portuguese. The priests feared charges of apostasy were they to submit to Kongo healing rituals. Dom Afonso wanted their cooperation, and so if they would not be healed by the "powders and ceremonies" of Kongo healers then Portuguese ones could be acquired easily enough.

This of course is not to say that the adoption of Catholicism itself was insincere. Quite the opposite. John Thornton (1984) and, most recently, Cécile Fromont (2014) have argued that the Kongo did not see spiritual life in such mutually exclusive terms, which would explain why those who were not "confirmed and instructed" nevertheless saw themselves as part of the Catholic community, and why they did not see their reliance on the "powders and ceremonies" of "antiquity" as in opposition to that community. In many ways, according to Thornton, the Catholic prelates who journeyed there took a similarly flexible view. And if, as Fromont has argued, Afonso I inaugurated the process by which the Kongo creatively and strategically appropriated European Catholic imagery, material, and iconography, this letter to João III would be an extension of that dynamic into the arenas of both medicine and diplomacy.

Details of the Portuguese Crown's response highlight something else. In a missive authored near the end of 1529, João III readily agreed to Dom Afonso's request. Indeed, a coterie of "physicians and apothecaries" were by then already "on their way." And if historians are inclined to see such requests as solicitations for recognizably more efficacious forms of knowledge, the Portuguese king himself harbored rather severe doubts. "Whether their cures are of any benefit in that land" was an open question. Dom João was not even sure that the medicines themselves would survive the trip (Brásio 1952, 1:523). If his contingent of physicians and apothecaries did indeed prove to be of use, Dom João assured Afonso I that he would be happy to send more of them.

After addressing a range of other issues (including the impending visit to Rome by the Bishop of Kongo, Dom Afonso's brother Henrique), the Portuguese king asked Afonso I for assistance with medical matters of his own. João III was particularly interested in unicorn horns; he was curious about their curative power and uncertain how exactly one concocted medicines with them. He was under the impression that unicorns and their remains were to be found in the dominions of the king of Kongo. He hoped that Afonso I might be able to provide some clarity on these questions. "Tell me," he wrote, "whether you have unicorn horns [at your disposal]" and "whether there be any doubt [that they are in fact said horns]." He continued, "I would most greatly appreciate it if you might send a pair of them to me and, if they are truly [unicorn horns], send to me as well [an explanation of] the manner by which you take them so as to derive the greatest benefit" (Brásio 1952, 1:523 and 530–531).

The preoccupation with unicorn horns was much more than an idiosyncratic interest of João III. Across western Christendom, the elusive horns of this mysterious creature were believed to be potent medical panaceas and were especially prized for their power as an antidote to poison. Unicorn horns were also highly valued among a diversifying community of naturalists. Items reputed to be unicorn horns found their way into collections across the Mediterranean (e.g., Novoa 2012).

In questions that were nominally medical and entailed the properties of material, a great deal more was at stake. Just as Afonso I sought assistance from João III to secure physicians who might foster the continued development of Catholicism within Kongo, and in so doing strengthen diplomatic and political relationships with his Portuguese ally, so too did João III enlist Afonso I, his nominal vassal and fellow head of state, in his own bit of bioprospecting. Without the other, each would have been hindered in some small but potentially significant way. In central Africa, Afonso would not have been able to secure the commercial commitments that supplied the manufactures he used to enlarge his domain. In Europe, a gift economy that increasingly included *mirabilia* from the overseas world not only strengthened relationships between the royal household of João III and his in-laws spread across Hapsburg Europe (his wife, Queen Catherine of Austria, was a noted collector), but it also linked the Portuguese nobility to wealthy collectors like the Fuggers, who would soon become, among other things, major financiers of Brazilian sugar plantations (Gschwend 1995; Schwartz 2004).

The relationship between Dom João and Dom Afonso was not one of dominance but of collaboration born of mutual self-interest. Exchanges and benefits moved in many directions. While it is certainly true that trade goods and slaving activities would ultimately bolster Portuguese interests at the expense of Kongo political authority, those longer-term ramifications were impossible to predict. The imperial asymmetries that would ultimately take shape were contingent, not inevitable, and not traceable as an immediate, obvious, or automatic outcome of the relationship that Afonso I and João III cultivated with one another.

In a world of competing empires and composite monarchies, political authority and imperial control were always tenuous and negotiated (Burbank and Cooper 2010). The exchange of natural knowledge embodied in material objects was instrumental to those processes and facilitated the convergence of political, diplomatic, curative, spiritual and other interests. Medical expertise and technologies of healing were, like legal and clerical expertise, co-produced with the imperial order itself.

Intellectuals and Literacy; Alterity and Commensurability

Focusing on objects in another way—emphasizing especially the dynamics of production—can help address other persistent analytical challenges. In particular, it can build on and expand prevailing conceptions of the “indigenous intellectual.” And it can subvert arguments for epistemological and ontological incommensurability inherent in earlier but still influential work that stresses alterity (often, though not always, through the flattening language of the “other”).

The concept of the indigenous intellectual places particular stress on engagement in political and religious life and takes literacy—understood broadly as a form of graphic inscription and representation—as the privileged form of enacting that engagement. The centrality of literacy and writing to conceptions of what it might mean to be an intellectual in colonial Latin America—and to whether it would be possible to speak of indigenous intellectuals at all—has a distinct and important lineage in Latin American studies. It is a formulation whose scope and content are rooted in colonialism itself. Spaniards and Portuguese drew clear distinctions between the study of law and theology, which were anchored by philosophical knowledge and encoded in a textual tradition for which literacy was a prerequisite (and which, along with medicine, formed the higher faculties of university study), and craft knowledge, acquired through repeated practice and often by way of apprenticeship. The former, which was judged more theoretical and hence more sophisticated, was held in greater esteem than the latter, which was judged to be embodied and merely practical. This hierarchy derived from the Aristotelian distinction between the head and the hand (Long 2003) and was one element of an Iberian Renaissance culture in which the first generations of Spanish and Portuguese colonial administrators were steeped. Iberians viewed literacy and command of alphabetic script as marks of intellectual prowess and high cultural attainment. Disciplined bodily practice did not enjoy the same prestige. This vision would become formative for colonial ideologies legitimating conquest and colonization (Mignolo 1995).

Until recently, scholarship on precolonial and colonial Latin America across fields continued to privilege literacy as defined by the command of alphabetic, phonetic script. Most early treatments of colonial intellectual life focused on the work of Spanish- and Portuguese-speaking elites and emphasized forms of composition that could be encompassed within metropolitan genres of literary and artistic production (Boone and Mignolo 1994; McDonough 2014). Ángel Rama’s book *The Lettered City* ([1984] 1996) charted

a new way to think about the centrality of alphabetic literacy to colonial intellectual life. Rama left aside considerations of literacy and urbanity as marks of high culture to show instead how university-schooled, lettered men—bureaucrats, churchmen, lawyers, academics, and others—based in Spanish colonial cities shaped Spanish American society in ways that were both broader and more profound. He showed how the *letrados* who populated the institutions of an expanding Spanish colonial state and who directed its affairs also established the terms and limits of political discourse, and in so doing consolidated the cultural hegemony of literacy over orality. Literacy came to function as a coercive epistemic form. Alphabetic literacy defined what it meant to engage in serious, systematic, and otherwise disciplined mental labor. Political and religious life became privileged domains for operationalizing that knowledge.

In the wake of Rama's study, initial questions about whether and to what extent native persons might have participated in colonial intellectual life soon gave way to explorations of the many ways in which they very clearly and undeniably did so. The very meanings of literacy have since multiplied, and the social and geographic boundaries of Rama's original thesis have been exploded. From the urban core of the Spanish empire in the Americas to its ostensible rural periphery, it is now possible to speak of indigenous and mestizo intellectuals and to demonstrate the ways in which even minor clerks and notaries participated in a bustling, literate colonial world (Burns 2010; Rappaport and Cummins 2012; Rasmussen 2012; Ramos and Yannakakis 2014).

Yet it has also become clear that literacy, however broadly conceived, only partially reflects pre-Columbian and lasting indigenous perspectives—both of the relationship between literacy, politics, and intellectual life, on one hand, and of indigenous conceptions of knowledge, on the other. As literary scholar Kelly McDonough has written in her study of five centuries of Nahuatl intellectual life, even for those Nahuas “who regularly interacted with (or even aligned themselves with) Western cultures, their activities and obligations do not necessarily correlate precisely with Western understandings of knowledge production or intellectualism” (McDonough 2014, 7). Indeed, not only in central Mexico but in Central America and the Andes as well, indigenous definitions of knowledge did not match European colonial ones.

To insist on something recognizable as literacy as the emblem of serious mental labor, and to seek its practice only in familiar domains of political and religious life, would itself be to reinscribe a certain coloniality. Walter Mignolo made very nearly this same point in the pages of this journal some two and a half decades ago (Mignolo 1993). Yet the insight has proven hard to put into practice. Hence, in the conclusion to one of the most recent collections of essays on the subject of indigenous intellectuals, anthropologist Tristan Platt underscored the extent to which “the term ‘intellectual’ reflects a European attitude to *knowing* with a different genealogy from that of its Amerindian counterparts,” and, referencing the Aristotelian distinction that underwrote Iberian colonial categories, went on to note that even among indigenous communities who had scripts of their own, “this deep-seated European distinction between contemplative (theoretical) and practical ways of knowing is not so evident in the Amerindian tradition.” What counts as literacy, its moral value, and its centrality to intellectual labor—as well as the very distinction between intellectual and bodily labor—are not universal but historically and culturally variable. As Platt suggested, one of the ways to explore these other knowledges and the worlds they reference is to attend more closely to practice itself (Platt 2014, 267).

Both the critique and the suggestion are worth stressing. To get at the diverse ontologies, materialities, and ways of knowing in the colonial world means to suspend (or collapse?) the colonial distinction between theoretical and practical knowledge. It means to expand the definition of knowledge beyond that referenced by metropolitan categories. And, signally, it entails moving beyond graphic literacy altogether. By no means do I want to be dismissive of scholarship on literacy and I am certainly not arguing that it be abandoned or replaced. But I do mean to suggest that literacy—even when broadly conceived in terms of graphic pluralism—risks leaving out nonliterate subjects of the Iberian world and discounts innumerable forms of tacit and embodied knowledge that either did not take graphic form or were not solely graphic in their expression. Disciplined intellectual labor and technical expertise were not signaled by graphic literacy alone; rather, specialized knowledge took many forms and could be conveyed in many ways. One way was practice. And, as I discuss below, it is through practice that vernacular epistemologies and subaltern technical expertise are increasingly brought under examination.

Yet to focus on objects and meanings, and to see intellectual subtlety and sophistication expressed through practice or instantiated in material form rather than in writing, also means expanding the theoretical ground on which Latin American studies tends to operate. Much of the theoretical framework for scholarship on indigenous intellectuals and literacy derives from the work of Antonio Gramsci and especially Michael Foucault (de la Campa, 1999, chap. 5). Both thinkers were committed to questions of practice. As historians Ramos and Yannakakis point out, for Gramsci, “intellectuals not only lead, but also persuade, mediate, and

animate" (Ramos and Yannakakis 2014, 2). And, as Colin Gordon has explained, Foucault was sufficiently stung by criticisms of his *Discipline and Punish* that in subsequent work he began to specify the possibilities for impactful political action (Gordon 1991). Part of the ongoing appeal of both theorists and others has been their ability to link quotidian intellectual practices to broader contests of political power. These are the concerns that continue to sustain new research into issues of subaltern political agency; thanks to these and other theoretical signposts, subaltern political philosophy has become a rich and expansive area of investigation (e.g., Trouillot 1995).

But not all forms of embodied and enacted expertise are so overtly concerned with, or meant to directly reference, political power. And those are ill-suited to analysis through these more familiar frameworks. It has consequently been difficult to access aspects of subaltern intellectual life. In contrast to subaltern political practice and political philosophy, subaltern craft and natural philosophy remain but incipient parts of the scholarly literature. Yet it is possible to read material artifacts as expressions of unspoken or unwritten, tacit knowledge. For example, as historian of science Pamela Smith has demonstrated (building on the work of Michael Polanyi, Marcel Mauss, and Eugene Ferguson), a maker's choice of materials itself reflects a knowledge of what particular substances can and cannot be used for—what they can and cannot do, what is and is not possible in the materials in question specifically and in nature generally (Smith 2004, 6–8, 114–120, and 245 n. 16). Not only the designs of artifacts but their very materiality can be interpreted as constituting claims about the organization of the cosmos or the inner workings of the natural world. Purposefully crafted objects, in other words, reference epistemologies and embed ontological claims. And like claims made in writing, these too ultimately have political import, for they can help sustain belief, generate shared identities, articulate political or religious allegiance, and variously underwrite, defend, and circumscribe authority.

A number of recent works have demonstrated the value of such a perspective for revealing forms of expertise that were both highly technical and philosophically informed but were neither accommodated by colonial categories nor encompassed by those conventional to modern Western scholarship. One example is the recent work of Cécile Fromont, which operates at the intersection of history, art history, and anthropology. Her study takes up the story of Kongo Christianity during and after the influential reign of Afonso I. It is meant to counter claims that Christianity spread in the kingdom as a consequence of foreign coercion, that its tenets were neither well understood nor taken seriously, and that it had little influence on the spiritual life of Kongo. Although literacy was important for Kongo rulers (and especially Dom Afonso), Fromont has set the intellectual dynamism of the kingdom into high relief by tracing the processes of material production by which such things as ivory and brass crucifixes were manufactured and serially reinterpreted. Cosmologies were realized and rendered visible, touchable, and otherwise sensible by craftsmen who were expert in shaping material. Their work need not be reduced to literacy, however broadly conceived, or to narratives of resistance or appropriation. Their combined (inseparable, really) intellectual and physical labor articulated spiritual claims that established the imaginative extent of what Fromont calls "Kongo Christianity," and in so doing also demarcated (much as the unicorn horns discussed earlier) the limits of Iberian influence (Fromont 2014, chap. 2).

Historian of science Matthew Crawford has shown how the use of cinchona bark to treat malarial and other fevers in the Andes was an improvised colonial technology that reflected not imported Galenic assessments of the curative capacity of the bark, but long-standing indigenous understandings of nature, disease, and the body. Just as Galenic medical doctrine conceived of medicinal properties in terms of temperature and moisture (hot/cold and wet/dry), so too did native communities of the Loja region of Ecuador determine the therapeutic potential of objects based on their perceived heating or cooling qualities. In the particular case of cinchona's ostensible therapeutic uses, Spaniards and native inhabitants disagreed. In part because of its bitter taste, Spaniards deemed cinchona hot and therefore unsuited to treating fevered bodies. Indigenous inhabitants judged cinchona a cooling medicament and insisted that, to the contrary, it was an ideal treatment for fever. And indeed, despite claims rooted in the Galenic corpus, cinchona was in practice very often found to be an efficacious treatment for fever.

As a febrifuge, cinchona was a colonial Andean technology. The implications of the debate over its properties, however, went far beyond questions about this particular tree bark. Indigenous ontologies and native sensory experience—rather than those of the Spaniards—more reliably captured nature's truths. As Crawford details, precisely because cinchona's observed properties could ground a variety of truth claims and reflect multiple forms of expertise, the bark became foundational for medical debates that colonialism inaugurated but which imperial institutions could not contain (Crawford 2016).

Art historian Amy Buono has highlighted objects, materiality, and indigenous expertise through her examination of *tapirage*. The propagation of selectively colored feathers on live birds was practiced widely in

the Americas and particularly among the Tupi-speaking peoples of Brazil. By, among other things, plucking feathers from certain birds (especially parrots, macaws, and the scarlet ibis) and then applying pigment to the area surrounding the injured follicles, the Tupi were able to cultivate feathers in novel hues that ranged from red to black, and from white to dark blue and green. These were then used for the creation of feathered garments and especially elaborate and brightly colored capes. The key to understanding the meaning of tapirage among the Tupi, argues Buono, was the metaphor of transformation. The technology of tapirage entailed two transformations: first the manipulation of the living avian organisms; second the enactment of ritual transformations on the part of the human who took on the feathered mantle. Dressed in elaborate capes, ritual participants became divinities in avian form. The transformation was at once morphological, visual, tactile, and optical: expert craftsmen arranged the harvested feathers not only so that the wearer could take on a particular creaturely shape, but they layered the feathers so that they reflected light like the birds themselves. As Buono suggests, the implications for Portuguese trade were potentially profound. The Tupi could bilk Europeans by shilling counterfeit feathers, thereby undermining the early modern gift economy (Buono 2012). To push the analysis a bit further, this ontology—in which quotidian, enacted metamorphosis was so central, and which seemed to collapse the division between nature and culture—directly challenged that of sixteenth- and seventeenth-century European authorities, for whom a firm distinction between nature and culture increasingly underwrote political and religious authority (Daston 1998).

Historian Pablo Gómez has provided what is perhaps the most ambitious account to date of the ways in which subaltern expertise, expressed through embodied practice and the materiality of objects, became foundational for a colonial Iberian world. Gómez traced the dynamic development of a variegated Caribbean sensorium in which healers of diverse African descent created densely layered somatic experiences for their patients and observers. These *mohanes* made their powers palpable in such things as bleeding knives and severe weather, demonstrating an expertise on which their colonial contemporaries depended. Gómez pushes the point further still. He shows that black healers and their instruments (such things as chicken feathers and hyssop syringes), rather than white savants and their tools, established what was possible to hear, feel, see, taste, smell, and even imagine as possible in the colonial Caribbean (Gómez 2017).

All of these works emphasize the physical, sensible, material qualities of specific objects and the specialized knowledge about those qualities, which were foundational to the uses to which they were put and the meanings that they could be made to contain. A reorientation to objects, materiality, and practice extends the insights of studies of literacy and highlights domains of subaltern expertise and technical sophistication that forms of graphic inscription do not, opening unrecognized domains of political engagement in the process.

Furthermore, emphasizing the historicity of epistemic and ontological categories as they were theorized and operationalized by particular historical subjects calls into question the frequent claims of radical alterity that remain prominent in Latin American studies. What literary scholar Ralph Bauer has puckishly described as a situation in which “cultures encountered but never met” (Bauer 2008, 101), radical alterity conceptualizes cultural difference as not only profound divergence but mutually exclusive and, at least initially, mutually unintelligible systems of meaning. Scholars of Latin America from a range of disciplines have long identified and examined seemingly clear cases of such semiotic incommensurability, particularly in the colonial period and between native peoples and Iberian colonizers (e.g., Todorov 1984; Adorno 1991; Seed 1991; Cummins 1994).

Yet, as an interpretive framework, alterity has come under increasing scrutiny. Scholars of both Latin America and science and technology have wrestled with its significant shortcomings. The problem is not just that alterity tends to lock historical cultures, identities, ontologies, and epistemologies into sets of qualities or characteristics that are understood to remain stable through time but also that, in so doing, it presumes the very things—the constituents of that alterity itself—that need explanation. And by taking alterity as the starting point for analysis, the framework obscures possibilities for—and moments of—convergence.

In response, specialists in both Latin American studies and STS have begun to adopt approaches that emphasize historical specificity. Primarily concerned with identitarian knowledges, specialists of Latin America have begun to historicize the markers of alterity, charting the ever-shifting ways in which difference is constructed and explaining how and why those constructions changed with time (e.g., López Caballero and Acevedo-Rodrigo 2018). Science studies specialists, also attending to the impermanence of difference, have similarly embraced a skepticism of essentialist renderings of ontological and epistemic otherness. Suman Seth has described the method as entailing a “rejection of incommensurability as a means of understanding epistemic difference and, in general the eschewal—as *analytic* rather than *actors’* categories—of the binaries that so profoundly structured colonial discourse” (Seth 2009, 377; italics in the original). Incommensurability becomes a viable analytical position to take only when historical agents themselves perceived it as such.

Because objects concretize and enable human social and cultural relations, they can be read as evidence of alterity or its absence, as the issue was understood by the historical actors in question. And far more often than one might have expected, convergence and understanding rather than alterity born of cultural incommensurability appear to have characterized the multiple ways of knowing that populated Iberian colonies. Catholic missionaries and subjects of Kongo clearly “met” one another. As Fromont explains, “The cross formed the nexus through which central African and Christian discourses of power and cosmological thought entered into dialogue.... As a central symbol in both Kongo and European religious thought, it allowed the two sides to ascertain the religious significance of ... conversion in their own terms as well as to establish the epistemological common ground regarding the nature of the supernatural and the its worldly manifestations” (Fromont 2014, 67 and 78–79). As Crawford highlights, the jointly perceived anti-febrile properties of cinchona bark served as the ontological common ground for the otherwise disparate medical expertise of Spaniards and Andeans. Buono shows that the Jesuits and Tupi alike understood the wearing of feathered capes in terms of ritual transformation, and this made those vestments integral not just to the rituals of the Tupi shamans but to the sacrament of baptism presided over by Jesuit priests. One of the many strengths of Gómez’s argument is that *mohanes* possessed a curative authority and a technical expertise that were recognized by all of their Caribbean contemporaries, and not just those linked by diasporic affiliation. What Gómez calls the experiential Caribbean was an ontological world of its own, inhabited by all *caribeños*.

Objects and Alternative Geographies

Finally, object-oriented studies can productively challenge the geographies privileged by the Latin American and Atlantic spatial frameworks. This is not to diminish the continued importance of either of them. For both the colonial and modern eras of the Latin American past, a regional frame has helped enable comparative perspectives that challenge pernicious narratives of US exceptionalism (Shukla and Tinsman 2007). The now well-established Atlantic world approach has drawn into sharper focus the inseparability of cultural, political, economic, environmental, epistemological, and technological transformations once understood as regionally discrete phenomena (e.g., Sweet 2003; Dubois 2004; Warsh 2018).

But even these frameworks have their limits. And those limits are thrown into sharp relief by focusing on objects. Although, for example, an Atlantic frame may at first appear an appropriate scale for an exploration of the exchange of purported unicorn horns—and even as it usefully brings together Mbanza Kongo, Lisbon, and Rome within the same analytical and narrative frame—it also cleaves off key aspects of the story. The importance of unicorn horns as both medical panaceas and items of collection cannot be understood with reference to the Atlantic alone. It demands comprehending a wider story.

Unicorn horns were among the *materia medica* produced through the convergence of medical, commercial, and diplomatic interests among communities spread across the globe. By the middle of the sixteenth century, the trading communities that constituted Portugal’s global empire were scattered across a range of diverse epidemiological environments. Enigmatic fevers experienced first in West Africa patterned subsequent medical encounters from South Asia to South America, giving rise to a pervasive concern with fever. It was the geography of Portugal’s empire and the perceived similarities of the flora, fauna, and climate across that empire that increasingly focused attention on a discreet range of medical panaceas, of which unicorn horns were but one example. Unicorn horns joined other curative objects such as bezoar stones and theriac as they were exchanged globally within, between, and beyond the theaters of Portuguese colonialism. Everywhere they became subsumed within locally constituted cultures of collection, natural inquiry, and medical practice. Lisbon, Rome, and Mbanza Kongo were but three such locations; the phenomenon unfolded as well in Mozambique Island, Goa, and Malacca. If modern scholarship privileges an Atlantic story, that was not the view of historical actors themselves. They increasingly saw such itineraries of circulation as constituting not only Atlantic but Indian Ocean and intertropical worlds as well. The early modern world was rife with overlapping—but by no means mutually exclusive—spatialities. And it was within that multiplicity of frameworks that colonial science and imperial policy alike were variously conceived (Cagle 2018).

As scholarship has shown, Mbanza Kongo, Goa, the Caribbean, the Andean highlands, and New Spain—no less than Lisbon, London, Seville, or Paris—were places where foreigners and native peoples encountered, met, mingled, and produced new assemblages of materials, imagery, and meaning. More careful attention to the production and deployment of expert natural knowledge and of purposefully crafted objects calls into question the technology-based teleology that continues to suffuse even some the best scholarship on early modern empires. A focus on objects and embodied practice can expand accounts of intellectual expertise that are still too often tethered to notions of literacy, however broadly defined. The worlds made palpable by that expertise call into question the ostensible alterity so often presumed to have separated colonial agents and their others. By following objects across the early modern world and by paying renewed

attention to their materiality and the ways in which that materiality was successively reworked and imbued with local meaning, studies can remain thoroughly grounded in the particularities of place at every point, highlighting varied forms of expertise and intellectual dynamism along the way. And those points can be shown to be in important relationship to one another even if they are not circumscribed by a Latin American or Atlantic frame.

Acknowledgements

I would like to thank Allison Bigelow and Tom Klubock for the opportunity to contribute to the present collection of essays. I would also like to say tremendous thanks to the anonymous reviewers, whose feedback on earlier drafts was invaluable. At Utah, I thank my colleague and fellow colonial Latin Americanist, Rebecca Horn, as well as graduate student Mariana Alliatti Joaquim.

Author Information

Hugh Cagle is Associate Professor of History and Director of International Studies at the University of Utah. His research focuses on the relationship between science and colonialism in the early modern world. His first book, *Assembling the Tropics: Science and Medicine in Portugal's Empire, 1450–1700* (New York: Cambridge University Press, 2018) was awarded the 2019 Leo Gershoy Award from the American Historical Association. He is presently at work on two projects: one is a study of the practices of animal classification under Portuguese rule in Brazil and India; the other examines technologies of the Tupi-speaking peoples of Amazonia in the sixteenth and seventeenth centuries.

References

- Adorno, Rolena. 1991. "The Negotiation of Fear in Cabeza de Vaca's *Naufragios*." *Representations* 33: 163–199. DOI: <https://doi.org/10.1525/rep.1991.33.1.99p0032n>
- Anderson, Warwick, and Vincanne Adams. 2007. "Pramoedy's Chickens: Postcolonial Studies of Technoscience." In *The Handbook of Science and Technology Studies*, edited by Edward J. Hackett, Olga Amsterdamska, Wiebe E. Bijker, Michael E. Lynch, and Judy Wajcman, 181–204. Cambridge, MA: MIT Press.
- Bauer, Arnold J. 2001. *Goods, Power, History: Latin America's Material Culture*. New York: Cambridge University Press.
- Bauer, Ralph. 2008. "A New World of Secrets: Occult Philosophy and Local Knowledge in the Sixteenth-Century Atlantic World." In *Science and Empire in the Atlantic World*, edited by James Delbourgo and Nicholas Dew, 99–126. New York: Routledge.
- Bennett, Jane. 2010. *Vibrant Matter: A Political Ecology of Things*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822391623>
- Bigelow, Allison. 2016. "Incorporating Indigenous Knowledge into Extractive Economies: The Science of Colonial Silver." *Journal of Extractive Industries and Society* 3: 117–123. DOI: <https://doi.org/10.1016/j.exis.2015.11.001>
- Bijker, Wiebe E., Thomas Parke Hughes, and Trevor Pinch, eds. 2012. *The Social Construction of Technological Systems*. Anniversary edition. Cambridge, MA: MIT Press.
- Bleichmar, Daniela. 2012. *Visible Empire: Botanical Expeditions and Visual Culture in the Hispanic Enlightenment*. Chicago: University of Chicago Press. DOI: <https://doi.org/10.7208/chicago/9780226058559.001.0001>
- Bleichmar, Daniela, Paula De Vos, Kristin Huffine, and Kevin Sheehan, eds. 2009. *Science in the Spanish and Portuguese Empires, 1500–1800*. Stanford: Stanford University Press. DOI: <https://doi.org/10.1126/stanford/9780804753586.001.0001>
- Bogost, Ian. 2012. *Alien Phenomenology, or What It's Like to Be a Thing*. Minneapolis: University of Minnesota Press. DOI: <https://doi.org/10.5749/minnesota/9780816678976.001.0001>
- Boone, Elizabeth Hill, and Walter D. Mignolo, eds. 1994. *Writing without Words: Alternative Literacies in Mesoamerica and the Andes*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822379263>
- Brásio, António, ed. 1952–1988. *Monumenta Missionaria Africana. África Ocidental*. Series 1, 15 vols. Lisbon: Agência Geral do Ultramar.
- Briggs, Charles L., and Clara Mantini-Briggs. 2016. *Tell Me Why My Children Died: Rabies, Indigenous Knowledge, and Communicative Justice*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822374398>

- Buono, Amy. 2012. "Crafts of Color: Tupi Tapirage in Early Colonial Brazil." In *The Materiality of Color: The Production, Circulation, and Application of Dyes and Pigments, 1400–1800*, edited by Andrea Feeser, Maureen Daly Goggin, and Beth Fowkes Tobin, 235–246. New York: Routledge. DOI: <https://doi.org/10.4324/9781315085982-18>
- Burbank, Jane, and Frederick Cooper. 2010. *Empires in World History: Power and the Politics of Difference*. Princeton: Princeton University Press.
- Burns, Kathryn. 2010. *Into the Archive: Writing and Power in Colonial Peru*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822393450>
- Cadena, Marisol de la. 2015. *Earth Beings: Ecologies of Practice across Andean Worlds*. Durham, NC: Duke University Press.
- Cagle, Hugh. 2018. *Assembling the Tropics: Science and Medicine in Portugal's Empire, 1450–1700*. New York: Cambridge University Press. DOI: <https://doi.org/10.1017/9781108164856>
- Candiani, Vera S. 2014. *Dreaming of Dry Land: Environmental Transformation in Colonial Mexico City*. Stanford: Stanford University Press. DOI: <https://doi.org/10.11126/stanford/9780804788052.001.0001>
- Cañizares-Esguerra, Jorge. 2001. *How to Write the History of the New World: Histories, Epistemologies, and Identities in the Eighteenth-Century, Atlantic World*. Stanford: Stanford University Press.
- Cañizares-Esguerra, Jorge. 2004. "Iberian Science in the Renaissance: Ignored How Much Longer?" *Perspectives on Science* 12 (1): 86–124. DOI: <https://doi.org/10.1162/106361404773843355>
- Carney, Judith, and Nicholas Rosomoff. 2009. *In the Shadow of Slavery: Africa's Botanical Legacy in the Atlantic World*. Berkeley: University of California Press.
- Coole, Diana, and Samantha Frost. 2010. *New Materialisms: Ontology, Agency, and Politics*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822392996>
- Crawford, Matthew James. 2016. *The Andean Wonder Drug: Cinchona Bark and Imperial Science in the Spanish Atlantic, 1630–1800*. Pittsburgh: University of Pittsburgh Press. DOI: <https://doi.org/10.2307/j.ctt1f89t3p>
- Crosby, Alfred W. 1986. *Ecological Imperialism: The Biological Expansion of Europe, 900–1900*. New York: Cambridge University Press.
- Cueto, Marcos. 2007. *Cold War and Deadly Fevers: Malaria Eradication in Mexico, 1955–1970*. Baltimore: Johns Hopkins University Press.
- Cummins, Tom. 1994. "Representation in the Sixteenth Century and the Colonial Image of the Inca." In *Writing without Words: Alternative Literacies in Mesoamerica and the Andes*, edited by Elizabeth Hill Boone and Walter D. Mignolo, 188–219. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822379263-009>
- Daston, Lorraine. 1998. "The Nature of Nature in Early Modern Europe." *Configurations* 6 (2): 149–170. DOI: <https://doi.org/10.1353/con.1998.0014>
- Dear, Peter, and Sheila Jasanoff. 2010. "Dismantling Boundaries in Science and Technology Studies." *Isis* 101: 759–774. DOI: <https://doi.org/10.1086/657475>
- De la Campa, Román. 1999. *Latin Americanism*. Minneapolis: University of Minnesota Press.
- Dubois, Laurent. 2004. *A Colony of Citizens: Revolution and Slave Emancipation in the French Caribbean, 1787–1804*. Chapel Hill: University of North Carolina Press.
- Espinosa, Mariola. 2009. *Epidemic Invasions: Yellow Fever and the Limits of Cuban Independence, 1878–1930*. Chicago: University of Chicago Press. DOI: <https://doi.org/10.7208/chicago/9780226218137.001.0001>
- Few, Martha. 2015. *For All of Humanity: Mesoamerican and Colonial Medicine in Enlightenment Guatemala*. Tucson: University of Arizona Press.
- Few, Martha, and Zeb Tortorici. 2013. *Centering Animals in Latin American History*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822397595>
- Fromont, Cécile. 2014. *The Art of Conversion: Christian Visual Culture in the Kingdom of Kongo*. Chapel Hill: University of North Carolina Press. DOI: <https://doi.org/10.5149/northcarolina/9781469618739.001.0001>
- Gómez, Pablo F. 2017. *The Experiential Caribbean: Creating Knowledge and Healing in the Early Modern Atlantic*. Chapel Hill: University of North Carolina Press. DOI: <https://doi.org/10.5149/northcarolina/9781469630878.001.0001>
- Goodman, David C. 1988. *Power and Penury: Government, Technology, and Science in Philip II's Spain*. Cambridge: Cambridge University Press.

- Gordon, Colin. 1991. "Governmental Rationality: An Introduction." In *The Foucault Effect: Studies in Governmentality*, edited by Graham Burchell, Colin Gordon, and Peter Miller, 1–52. Chicago: University of Chicago Press.
- Gschwend, Annemarie Jordan. 1995. "In the Tradition of Princely Collections: Curiosities and Exotica in the *Kunstkammer* of Catherine of Austria." *Bulletin of the Society of Renaissance Studies* 13: 1–9.
- Holbraad, Martin, and Morten Axel Pedersen. 2017. *The Ontological Turn: An Anthropological Perspective*. London: Cambridge University Press. DOI: <https://doi.org/10.1017/9781316218907>
- Jasanoff, Sheila. 2004. "Ordering Knowledge, Ordering Society." In *States of Knowledge: The Co-production of Science and Social Order*, edited by Sheila Jasanoff, 13–45. New York: Routledge. DOI: <https://doi.org/10.4324/9780203413845>
- Kananoja, Kalle. 2015. "Bioprospecting and European Uses of African Natural Medicine in Early Modern Angola." *Portuguese Studies Review* 23 (2): 1–25.
- Latour, Bruno. 1993. *We Have Never Been Modern*. Translated by Catherine Porter. Cambridge, MA: Harvard University Press.
- Law, John. 1986. "On the Methods of Long-Distance Control: Vessels, Navigation and the Portuguese Route to India." In *Power, Action and Belief: A New Sociology of Knowledge*, edited by John Law, 234–263. London: Routledge. DOI: <https://doi.org/10.1111/j.1467-954X.1984.tb00114.x>
- Long, Pamela O. 2003. *Openness, Secrecy, Authorship: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance*. Baltimore: Johns Hopkins University Press.
- López Caballero, Paula, and Ariadna Acevedo-Rodrigo, eds. 2018. *Beyond Alterity: Destabilizing the Indigenous Other in Mexico*. Tucson: University of Arizona Press. DOI: <https://doi.org/10.2307/j.ctt20fw7cq>
- McDonough, Kelly S. 2014. *The Learned Ones: Nahua Intellectuals in Postconquest Mexico*. Tucson: University of Arizona Press.
- Mignolo, Walter D. 1993. "Colonial and Postcolonial Discourse: Cultural Critique or Academic Colonialism." *Latin American Research Review* 28 (3): 120–134.
- Mignolo, Walter D. 1995. *The Darker Side of the Renaissance: Literacy, Territoriality, and Colonization*. Ann Arbor: University of Michigan Press.
- Mintz, Sidney W. 1985. *Sweetness and Power: The Place of Sugar in Modern History*. New York: Penguin.
- Mundy, Barbara E. 1996. *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geográficas*. Chicago: University of Chicago Press.
- Navarro Brotons, Víctor, and William Eamon, eds. 2007. *Más allá de la Leyenda Negra: España y la Revolución Científica*. Valencia: CSIC.
- Norton, Marcy. 2017. "Subaltern Technologies and Early Modernity in the Atlantic World." *Colonial Latin American Review* 26 (1): 18–38. DOI: <https://doi.org/10.1080/10609164.2017.1287322>
- Novoa, James Nelson. 2012. "Unicorns and Bezoars in a Portuguese House in Rome: António da Fonseca's Portuguese Inventories." *Ágora: Estudos Clássicos em Debate* 14: 91–111.
- Ortiz, Fernando. 1947. *Cuban Counterpoint: Tobacco and Sugar*. New York: Knopf.
- Pagden, Anthony. 1982. *The Fall of Natural Man: The American Indian and the Origins of Comparative Ethnology*. New York: Cambridge University Press.
- Pearson, M. N. 1995. "The Thin End of the Wedge: Medical Relativities as a Paradigm of Early Modern Indian-European Relations." *Modern Asian Studies* 29 (1): 141–170. DOI: <https://doi.org/10.1017/S0026749X00012658>
- Pimentel, Juan, and José Pardo-Tomás. 2017. "And Yet, We Were Modern. The Paradoxes of Iberian Science after the Grand Narratives." *History of Science* 55 (2): 133–147. DOI: <https://doi.org/10.1177/0073275316684353>
- Platt, Tristan. 2014. "Conclusion." In *Indigenous Intellectuals: Knowledge, Power, and Colonial Culture in Mexico and the Andes*, edited by Gabriela Ramos and Yanna Yannakakis, 261–278. Durham, NC: Duke University Press.
- Pletsch, Carl E. 1981. "The Three Worlds, or the Division of Social Scientific Labor, circa 1950–1975." *Comparative Studies in Society and History* 23 (4): 565–590. DOI: <https://doi.org/10.1017/S0010417500013566>
- Raj, Kapil. 2013. "Beyond Postcolonialism ... and Postpositivism: Circulation and the Global History of Science." *Isis* 104 (2): 337–347. DOI: <https://doi.org/10.1086/670951>
- Rajão, Raoni, and Sandra Harding. 2018. "Why Tapuya?" *Tapuya: Latin American Science, Technology, and Society* 1 (1): 87–91. DOI: <https://doi.org/10.1080/25729861.2018.1539562>

- Rama, Ángel. [1984] 1996. *The Lettered City*. Translated by John Charles Chasteen. Durham, NC: Duke University Press.
- Ramos, Gabriela, and Yanna Yannakakis, eds. 2014. *Indigenous Intellectuals: Knowledge, Power, and Colonial Culture in Mexico and the Andes*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822376743>
- Rappaport, Joanne, and Tom Cummins. 2012. *Beyond the Lettered City: Indigenous Literacies in the Andes*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822394754>
- Rasmussen, Birgit Brander. 2012. *Queequeg's Coffin: Indigenous Literacies and Early American Literature*. Durham, NC: Duke University Press.
- Roberts, Elizabeth F. S. 2012. *God's Laboratory: Assisted Reproduction in the Andes*. Berkeley: University of California Press.
- Roberts, Lissa. 2009. "Situating Science in Global History: Local Exchanges and Networks of Circulation." *Itinerario* 33 (1): 9–30. DOI: <https://doi.org/10.1017/S0165115300002680>
- Safier, Neil. 2008. *Measuring the New World: Enlightenment Science and South America*. Chicago: University of Chicago Press. DOI: <https://doi.org/10.7208/chicago/9780226733562.001.0001>
- Sayes, Edwin. 2014. "Actor-Network Theory and Methodology: Just What Does It Mean to Say That Nonhumans Have Agency." *Social Studies of Science* 44 (1): 134–149. DOI: <https://doi.org/10.1177/0306312713511867>
- Schwartz, Stuart B. 2004. "A Commonwealth within Itself: The Early Brazilian Sugar Industry, 1550–1650." In *Tropical Babylons: Sugar and the Making of the Atlantic World, 1450–1680*, edited by Stuart B. Schwartz, 158–200. Chapel Hill: University of North Carolina Press. DOI: https://doi.org/10.5149/9780807895627_schwartz.10
- Seed, Patricia. 1991. "'Failing to Marvel': Atahualpa's Encounter with the Word." *Latin American Research Review* 26 (1): 7–32.
- Seth, Suman. 2009. "Putting Knowledge in Its Place: Science, Colonialism, and the Postcolonial." *Postcolonial Studies* 12 (4): 373–388. DOI: <https://doi.org/10.1080/13688790903350633>
- Shapin, Steven. 1996. *The Scientific Revolution*. Chicago: University of Chicago Press.
- Shukla, Sandhya, and Heidi Tinsman, eds. 2007. *Imagining Our Americas: Toward a Transnational Frame*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822389958>
- Slater, John, and Maríaluz López-Terrada. 2017. "Being Beyond: The Black Legend and How We Got Over It." *History of Science* 55 (2): 148–166. DOI: <https://doi.org/10.1177/0073275317694897>
- Smith, Pamela H. 2004. *The Body of the Artisan: Art and Experience in the Scientific Revolution*. Chicago: University of Chicago Press. DOI: <https://doi.org/10.7208/chicago/9780226764269.001.0001>
- Soto Laveaga, Gabriela. 2009. *Jungle Laboratories: Mexican Peasants, National Projects, and the Making of the Pill*. Durham, NC: Duke University Press. DOI: <https://doi.org/10.1215/9780822391968>
- Stein, Stanley J. 1958. *Vassouras: A Brazilian Coffee County, 1850–1900. The Roles of Planter and Slave in a Plantation Society*. Princeton: Princeton University Press.
- Stepan, Nancy Leys. 1976. *Beginnings of Brazilian Science: Oswaldo Cruz, Medical Research and Policy, 1890–1920*. New York: Science History Publications.
- Stepan, Nancy Leys. 1992. *The Hour of Eugenics: Race, Gender, and Nation in Latin America*. Ithaca: Cornell University Press.
- Sweet, James H. 2003. *Recreating Africa: Culture, Kinship, and Religion in the African-Portuguese World, 1441–1770*. Chapel Hill: University of North Carolina Press.
- Sweet, James H. 2011. *Domingos Álvares, African Healing, and the Intellectual History of the Atlantic World*. Chapel Hill: University of North Carolina Press.
- Thornton, John. 1984. "The Development of an African Catholic Church in the Kingdom of Kongo, 1491–1750." *Journal of African History* 25 (2): 147–167. DOI: <https://doi.org/10.1017/S0021853700022830>
- Todorov, Tzvetan. 1984. *The Conquest of America: The Question of the Other*. New York: Harper and Row.
- Townsend, Camilla. 2003. "Burying the White Gods: New Perspectives on the Conquest of Mexico." *American Historical Review* 108 (3): 659–687. DOI: <https://doi.org/10.1086/529592>
- Trouillot, Michel-Rolph. 1995. *Silencing the Past: Power and the Production of History*. Boston: Beacon.
- Warsh, Molly. 2018. *American Baroque: Pearls and the Nature of Empire, 1492–1700*. Chapel Hill: University of North Carolina Press. DOI: <https://doi.org/10.5149/northcarolina/9781469638973.001.0001>
- Wolfe, Cary. 2009. *What Is Posthumanism?* Minneapolis: University of Minnesota Press.

How to cite this article: Cagle, Hugh. 2019. Objects and Agency: Science and Technology Studies, Latin American Studies, and Global Histories of Knowledge in the Early Modern World. *Latin American Research Review* 54(4), pp. 976–991. DOI: <https://doi.org/10.25222/larr:647>

Submitted: 18 June 2018

Accepted: 17 May 2019

Published: 11 December 2019

Copyright: © 2019 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See <http://creativecommons.org/licenses/by/4.0/>.

LARR

Latin American Research Review is a peer-reviewed open access journal published by the Latin American Studies Association.

OPEN ACCESS 