

## Iberian science: Reflections and studies

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### Abstract

Over the last two decades early modern historical studies of science, medicine, and technology in the Iberian world have developed into a broad-ranging field with contributions from scholars coming from different historiographical traditions and building upon the solid scholarship of earlier generations. This special issue is an opportunity to explore the field, its recent trends, acknowledge new perspectives that have contributed to the field's growth, and gauge future directions for the field. The six articles offer both reflections on the field's historiography and serve as examples of work currently under way.

### Keywords

Early modern, history of science, history of medicine, history of technology, Spain, Portugal, Latin America, Mexico, New Granada, Atlantic world

### A general reflection

The historian's task is twofold: to understand the past in its own terms and to explain it to the present in ways that are intelligible and relevant. The first part of our task presents unique challenges to historians of early modern science, medicine, and technology, particularly because it demands engaging with culturally embedded ways of thinking and doing that are inherently different from those that define the modern versions of those disciplines. The second part is invariably dictated by the world in which we live, the forces that shape it, the type of media through which we exchange information, and the technological systems that entangle every aspect of our lives. The start of the twenty-first century finds us in a globalized world, where multiculturalism is no longer the stuff of exotic travel but rather the very fabric of life, where information flows at an

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unprecedented rate and where technology is essential for maintaining our perception of well-being. It should come as no surprise then that the scholars in this special issue share a fascination with an era that can be described in the same terms: the early modern Iberian world during the era of the first globalization.<sup>1</sup>

This special issue had its genesis in a series of roundtables on the state of historical studies of early modern science and medicine in Spain, Portugal, and their empires held during the 2015 annual meeting of the Association for Spanish and Portuguese Historical Studies (ASPHS) at The Johns Hopkins University. That year marked the tenth anniversary of the very influential conference *Beyond the Black Legend: Spain and the Scientific Revolution*, organized by William Eamon and Víctor Navarro Brotons in Valencia.<sup>2</sup> On that occasion historians from Italy, Portugal, Spain, and the United States came together to discuss the role Iberian science played in the ‘Scientific Revolution,’ a label understood both as a historiographical construct and as a period of epistemic and methodological transformation. For many of us coming from outside Spain, the conference in Valencia was the first time we gathered as a cohort of specialists and had the chance to discuss our work with historians hailing from different countries and whose historiographical traditions led them to ask different questions. What was clear to me – as I surmised then – was that we were working in an invigorated field, where much work remained to be done and where novel perspectives, questions, and methodologies promised to open new avenues of historical investigation that would build upon the solid foundation laid by earlier generations of scholars in Spain and Portugal. Ten years later, in Baltimore, our objective was to discuss the development of the field and its historiography since 2005 and to share impressions of where the field was headed. We were pleased to draw audiences of 100-plus social and cultural historians of Iberia to the roundtables. The ASPHS conference also hosted an unprecedented nine sessions on the history of science, medicine, and technology in the Iberian world, something unimaginable ten years ago. For the most part, the papers in these panels were not given by bona fide historians of these fields but by area specialists who realize that leaving out science, medicine, and technology from their studies is leaving out *a lot*.

The last ten years have not been without their challenges, however. A worldwide recession impacted negatively the resources available to scholars in this and other fields. Throughout Europe, and particularly in Spain and Portugal, the pain was felt in the form

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1. Although Gunn did not engage substantially with the American continent when he first began using the term ‘first globalization’ to describe the Eurasian expansion between 1500 and 1800, in recent years the historical scholarship has brought the Spanish and Portuguese endeavors in the American continent under the rubric. This is a ‘moderate approach’ to globalization since it acknowledges pre-existing and subsequent processes of globalization, according to Diego Olstein. Economic history prefers to place the ‘first globalization’ in the nineteenth century, while others see it as a twentieth-century phenomenon. Geoffrey C. Gunn, *First Globalization: The Eurasian Exchange, 1500 to 1800* (Lanham, MD: Rowman & Littlefield, 2003); Diego Olstein, *Thinking History Globally* (Basingstoke: Palgrave Macmillan, 2014), p.127.
  2. Víctor Navarro and William Eamon (eds.), *Mas allá de la Leyenda Negra: España y la Revolución Científica / Beyond the Black Legend: Spain and the Scientific Revolution* (Valencia: Universitat de València-CSIC, 2007).

of curtailed hiring at universities, while research institutes saw their budgets slashed and important centers restructured. Too many promising scholars entering the field then abandoned academic careers, while some lucky ones have been caught in seemingly interminable cycles of temporary postdoctoral appointments. In North America, tenure-track appointments at universities – where most scholars in Iberian history of science make their careers – have become elusive, and those that remain demand a rather rigid sequence of scholarly production that discourages the risks associated with international collaboration, publication in nontraditional venues, or in languages other than English. Interdisciplinary, while much touted, poses no small number of risks, particularly to junior scholars on tight tenure tracks. Long-term collaborations across the Atlantic, truly sustained and fruitful, prove difficult to fund and justify to our respective institutional homes. And yet, as Slater and López-Terrada's collaborations demonstrate, not only are they possible but they can be highly productive. Despite the challenges that lie ahead as the field becomes more integrated into ongoing historical conversations, a survey of the scholarship of the last ten years shows a vigorous field, with no shortage of compelling questions and scholars committed to answering them.

### Approaches of the last ten years

What has led to this growth and interest in the field? As I hope the articles in this special issue will show, the greatest impetus has come from reframing the field's fundamental question. In many ways, the *autopsia cadaverum* of the 'Scientific Revolution' opened the field's vista to the type of inquiry these papers embrace.<sup>3</sup> Their authors realize that within the multicultural societies they study there are many ways of understanding the natural world. So, rather than looking for evidence of science (or its precursors) in the early modern era, as had long been the norm in the field, they instead explore humanity's relationship with the natural world and, in particular, how knowledge of the natural world was gained and organized in the historical actor's own terms. This has had several important implications for the type of questions we ask of the past. Especially in the early modern era, it means that humans' interaction with the natural world is inseparable from medicine and technology. Our historical actors give the best testament of this; for some of them, understanding the natural world entailed undertaking 'the study of nature' alongside western conceptions of knowledge-making practices – practices that might remind us of science – but it also included adjusting to changing conceptions and types of the human bodies and the means of healing them, deploying technological tools that helped humans live in often-hostile environments and positing new explanations for the relationship between God and the world, just to name a few. Not only are the questions taken up by the field broader than before, but so are the spaces where we ask these questions.

Whereas until the 1980s the focus was mostly on Spain and Portugal as defined by our modern notion of these nation-states, ten years ago found us reaping the benefits of an Atlantic history perspective that urged us to look for transoceanic and north/south ties.

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3. For a discussion of broader historiographical changes in the field of history of science, see Pamela H. Smith, "Science in Motion: Recent Trends in the History of Early Modern Science," *Renaissance Quarterly* 62 (2009): 345–75.

Now global history insists we should take the whole world as our locus of investigation. This only reinforces the multicultural scope of most of our works. As Slater and López-Terrada explain, “There are cultures enough within the Hispanic monarchy.”<sup>4</sup> Equally broad is the cast of characters: natural philosophers and theologians, alchemists and astrologers, midwives and herbalists, native healers and medical doctors, magi and charlatans, scholastic Aristotelians and experimentalists, explorers and traders, and plebeian cultivators, builders, and viceregal administrators. The vestiges documenting the historical relationship between humanity and the natural world are also not limited to the expected genres of the natural philosophical or medical treatises, but we now recognize that they are found in a variety of cultural productions, such as paintings, *lienzos*, pictograms, legal cases, maps, theatrical productions, in built and unbuilt environments, and in poems.

The second aspect of the historian’s task is to explain it to the present so it is accessible and relevant. Not too long ago this meant framing science of the early modern Iberian world so that it contributed to the grand narrative of the history of science. Although news about the demise of grand narratives might have been premature, this approach has proven increasingly unsatisfying in our multicultural, globalized world. In this special issue Pimentel and Pardo-Tomás describe the studies in our field as “a group of paths which do not always converge,” a consequence perhaps of our present concern to understand the heterogeneity of the world.<sup>5</sup> The history of early modern science in the Iberian world might very well be a multi-stranded meta-discourse of historians’ making, and yet I argue that it forms a cohesive account of humanity’s understanding of the natural world at a moment of profound dislocations; dislocations that were not just geographical but also epistemic, and where only a fraction of the conceptual changes entailed the adoption of experimental methodologies and epistemology associated with the New Science of the seventeenth century. Maybe there no longer is a grand narrative of the history of science, but there is still its history. Only now it consists of the juxtaposition of hundreds of experiences and ideas, which together form a discourse that can be framed historically. To make its history intelligible the historian of early modern Iberian science must first situate it within a complex context of an enormous scale; its relevance comes largely from what it tells us, not so much about the rise of modern science, but about understandings of nature in a multicultural and globalizing world.

What makes it cohere is that it is very much anchored in a common set of cultural markers – political, linguistic, and religious – that makes talking of an Iberian early modern world something recognizable, albeit intentionally fuzzy. It was less the Spain and Portugal that we know today than one of polycentric monarchies; a Spain of a composite monarchy and a Portugal of *feitorias* forming empires – a word never to be equated with hegemony – that extended from the heart of Europe and to the far corners of the world.<sup>6</sup> This first globalization began with the European expansion of the later fifteenth century

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4. John Slater and María Luz López-Terrada “Being Beyond: The Black Legend and How We Got Over It.” In this special issue.

5. Juan Pimentel and José Pardo-Tomás, “And Yet, We Were Modern. The Paradoxes of Iberian Science After the Grand Narratives.” In this special issue.

6. Pedro Cardim, Tamar Herzog, José Javier Ruiz Ibáñez, et al., *Polycentric Monarchies: How Did Early Modern Spain and Portugal Achieve and Maintain a Global Hegemony?* (Eastbourne: Sussex Academic Press, 2012), pp.3–8.

and was characterized by the interaction with native cultures that yielded the modern Spanish and Portuguese-speaking parts of the world after centuries-long processes of acculturation. Besides language, its other defining characteristic was the manner in which these global empires dealt with religious pluralism in light of the militant Catholicism of their ruling elites. Conversion to Christianity came in many guises, from the truly genuine, to the coerced, to the dissimulated. Yet all forms of conversion carried with it a powerful westernizing influence. These were not processes relegated to the periphery of empire alone, but also took place within the Iberian Peninsula, albeit mediated by hundreds of years of uneasy *convivencia* with its Muslim and Jewish populations. Woven into this complex world were also a variety of ways of understanding the natural world: from Christianized epistemic structures inherited from the ancient Greeks, to Nahua cosmologies, to whatever messages still lie undeciphered in the knotted strings of the Inca *quipú*. Science – if you permit me the shorthand – was also a cultural marker that, like in the case of language and religion, effervesced during the first globalization.

## The roads ahead

Discussants at the roundtables highlighted several areas of future development worth outlining here, if only briefly and in no particular order. The first is the study of cultural productions from the perspective of science, medicine, and technology. These have already yielded some fascinating insights into popular perceptions of science during the Spanish Baroque of the seventeenth century.<sup>7</sup> Scholars in this area are receptive to messages embedded in the way science, medicine, and technology was represented in a broad range of cultural productions, from satirical plays to highbrow poetry, paintings, and architecture. This approach recognizes that science and literature, in García Santo-Tomás's words, do not constitute autonomous discourses but rather inhabit a "shared universe."<sup>8</sup> In his work he has explained the skeptical and satirical reception of Galileo's optics and telescopic observations in Spain, while Marcaida has explored through the work of the Jesuit Juan Eusebio Nieremberg (1595–1658) a pervasive ethos of distrust toward sense perception and any science that promised definitive answers. For Slater and López Terrada, theatrical interludes – mostly satirical – serve as a window into a lively Spanish seventeenth-century medical marketplace and its critical (and knowledgeable) audience.<sup>9</sup>

Another way to approach the study of nature in the early modern Iberian world is by calling upon the arsenal of intellectual history. A traditional methodology to be sure, yet it was perhaps this approach that was most adversely affected by the cultural turn in

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7. John Slater, *Todos son hojas: Literatura e historia natural en el Barroco Español* (Madrid: Consejo Superior de Investigaciones Científicas, 2010); Enrique García Santo-Tomás, *La musa refractada: Literatura y optica en la España del Barroco* (Madrid: Iberoamericana; Frankfurt am Main: Vervuert, 2014); José Ramón Marcaida López, *Arte y ciencia en el Barroco Español: Historia natural, coleccionismo y cultura visual* (Sevilla: Fundación Focus-Abengoa; Madrid: Marcial Pons Historia, 2014).

8. García Santo-Tomás, *La musa refractada*, p.14. Slater makes a similar argument concerning Spanish literature of the Golden Age and botany, in Slater, *Todos son hojas*, p.45.

9. John Slater and Maríaluz López-Terrada, "Scenes of Mediation: Staging Medicine in the Spanish Interludes," *Social History of Medicine* 24 (2011): 226–43.

historical studies. It shifted focus away from the careful and close study of texts when much work still remained to be done. Let me put forth as an example the vast corpus of early modern commentaries on the natural philosophy of Aristotle. Yes, they are written in grueling scholastic Latin peppered with humanistic affectations. Indeed no one approaches casually the works of Domingo de Soto (1494–1560), Diego de Zuñiga (1526–98), Benito Pereria (1535–1610), and Francisco Suárez (1548–1617). These types of works were nonetheless the vehicle of choice for thinkers who sought gradual revisions to the western understanding of the natural world. Here is where the bulk of the scientific discourse of the era that made it to print took place. I suspect that when we begin to unravel this large corpus, we will find that these Iberian Aristotelians were not the backward scholastics the seventeenth-century advocates of the New Science led us to believe and were, in fact, responding to the same disquiet about the inability of traditional natural philosophy to explain nature. And in doing so, they opened cognitive spaces that allowed the New Science to eventually take hold in the Iberian world.

A third area focuses on recapturing forgotten or ignored bodies of knowledge which the historiography describes as ‘native,’ ‘indigenous,’ ‘plebian,’ or ‘from below,’ and folding them into our histories of science and medicine. It is a desire motivated by reasons that go far beyond trying to be sensitive to postcolonial concerns by including disenfranchised groups in history; it is also born of the realization on the face of historical evidence that early modern science in the Iberian world drew heavily on autochthonous bodies of knowledge whose sources and informants were rarely acknowledged by western naturalists. Yearn as we might to sit in on a conversation between Francisco Hernández and the Nahua doctors he debriefed and whose healing methods he observed so carefully, we will never recover the full import of their conversation. Historians of science and medicine working in this area are well-aware of the highly mediated nature of their documentary sources, so the task often entails essentially looking for vestiges of autochthonous knowledge, such as traces in a European map of lands white men had not reached yet, herbal remedies used by village/rural *curandero(a)s*, or Hebrew cosmologies that linger unacknowledged in the Iberian imaginary.

The authors in this special issue who tackled this challenge (De Vos and Candiani) point out the difficulty of fully recapturing these long-forgotten bodies of knowledge. Yet, the articles in this special issue show just how productive understanding the true scope of the technical challenges and scientific projects can be and identifying the persons who filled this gap. Candiani, for example, asks that we consider carefully what settling (*asentarse*) in a New World entailed and the type of technological know-how necessary for Europeans to successfully accomplish this. After painstakingly identifying these conditions she can assert that Amerindian expertise of their own environments and how to harness them must have been crucial for the survival of foreign settlers. De Vos recognizes that the type of botanical projects undertaken by Europeans in the Americas would have been impossible without the significant contribution of local inhabitants given of the scope of the projects, the variety of local traditions they attest to, and the clear textual evidence that European botanists comprehended barely a fraction of the nature that lay before them.

We invited contributions from scholars who participated in the roundtable discussions at the ASPHS conference (De Vos, Lanuza, Leitão, López-Terrada, Pardo-Tomás,

Pimentel, Sánchez, and Slater, with the addition of Candiani) to share their perspectives on the field and their research in this special issue. It is a privilege to open the special issue with two essays by eminent scholars of Spanish science and medicine in which they share their personal reflections on the development of the field. Pimentel and Pardo-Tomás consider how different historiographical traditions have shaped and continue to shape the field, and how their undeniable weight has directed research agendas and the all-important historical questions we ask. As their point of departure they look to discussions that took place during the Valencia conference and deconstruct them in the best possible way to show the markedly different agendas and approaches that in fundamental but not insurmountable ways differentiate the ways in which the history of early modern Iberian science is written. They show how two historical narratives – the Scientific Revolution and the Polemic of Spanish science – cast long shadows on the field and, in a moment of rare but welcomed introspection, explain how the dialectic between them has determined the historical questions asked by late-twentieth-century Spanish historians of science. They then turn to the work of historians of science not trained in Spain, but who work and write for the Anglophone scholarly community. They explore issues of personal identity, graduate education, and, perhaps more importantly in my opinion, the need (drive?) to integrate the history of early modern Iberian science into our understanding of the rise of modern science. In sum, their survey reveals a field that over the last twenty years has stepped confidently into international discourses by embracing new perspectives and approaches that skirt but do not ignore the historiography that preceded it. They point toward a future of a field that is happy to ask questions across national boundaries, oceans, and historiographies, and to historians who “have material with which to play down the exceptional nature of our historical objects and to show their parallels with other scenarios and trajectories of science.”<sup>10</sup>

For Slater and López-Terrada, the field has been more akin to a battleground where historians have been compelled to slay two dragons, each in different ways spawns of the Black Legend. The first is the invisibility of early modern Spanish cultural and scientific production in broader discourses of European history and the exceptionalism that has accompanied assessments of Spain (when it is even considered). The other dragon is the antithesis of this one: the ways in which historians have tried to make Spanish science visible. This latter effort has been characterized by what the authors describe as the ‘contributionist’ approach: presenting evidence of the impact of Spanish science, gauging reception by a European readership of Spanish works and documenting engagement with the right quarters of the Republic of Letters. Even studies of science in imperial contexts that encourage historians to consider the early modern scientific enterprise beyond European borders presents problems for Spanish historians of science because of the negative assessment of imperialism. The Black Legend and its spawns are best left slain and forgotten. The way forward for Slater and López-Terrada is driven by the “attempt to understand the values and perspectives of people who encountered and generated scientific knowledge in order to create a picture of the scientific cultures of a society at a given moment.”<sup>11</sup>

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10. Pimentel and Pardo-Tomás

11. Slater and López-Terrada

In the other four contributions, the focus shifts away from historiography and offers instead a sampling of current historical studies in the field. Leitão and Sánchez take a fresh look at what describing something that was both “new” and a “world” implied for naturalists writing during the first phase of early modern European expansion. They take into consideration in their analysis the magnitude of the task at hand: what did describing the nature of America, South Asia, and India for a western audience really entail? The abrupt nature of the events – half of the orb was made known to Europeans in little over thirty years – forced the naturalists to be selective in both content and style of presentation. The results were discourses that deployed a specific set of strategies in an attempt to comply with the difficult and often contradictory requirements involved in describing a *mundus*: choosing what to include or exclude from the account and to present it all in a way its reader considered authoritative. Some reached back to Plinian or Aristotelian models, but most did not follow conventional forms. (The ancients, after all, had never taken on the challenge of describing a New World!) Key to understanding first-phase narratives, Leitão and Sánchez explain, is reconstructing the process of selection undertaken in them. These have often been associated in the historiography with the era’s fascination with wonders, but they posit differently and point to a number of imperatives that dictated the author’s criteria for selection, with wonder rather lower in the list. They also analyze the style used to present the material and find, as in the case of Orta’s *Coloquio los Simples*, that the *coloquio* or conversational genre offered a way to navigate successfully the problems presented by having “too much to tell.” They also give a new perspective to how these authors set about establishing themselves as authorities on their book’s subject. Rather than the *autopic* perspective the historiography has long recognized in these texts, they trace a path through medicine and the Galenic *autopsia* that falls squarely in line with the medical background of Orta and other such writers.

It is an unavoidable fact of the cultural and intellectual life of early modern Spain and its empire that it had to contend with a powerful and ever-present institution of the Inquisition. But whereas the relationship between the Inquisition and science has been studied in minute detail in some prominent cases, such as those of Bruno and Galileo, it has been far less studied in the Iberian context, with the important exception of Pardo-Tomás’ essential *Ciencia y censura*. In this article Lanuza-Navarro explores the uneasy relationship between the Spanish Inquisition and astrology. She highlights the use of experts (*consultores*) who were enlisted by the Inquisition to issue opinions and recommendations when faced with a case involving an astrologer suspected of illicit practices. She notes that these experts found themselves in an uncomfortable position, having to defend their discipline and expertise, but also under pressure by an institution suspicious of astrology and inclined to issue harsh judgments. Lanuza-Navarro also situates the expert’s arguments within a long-standing debate – in Spain and elsewhere in Europe – about the need to renovate the discipline of astrology by purging from it what were seen as corrupting medieval and Arabic novelties. In Spain, the debate resurfaced periodically in the context of the preparation of a new *Index* of prohibited and expurgated books.

The final two articles are in fundamental ways the work of historians motivated by the desire to recapture and fold into a new history of early modern science the knowledge and ways of knowing among all subaltern populations of the Iberian world. Not only are

they convinced that the understanding of the natural world of the indigenous and *criollo* people of lands within the Spanish and Portuguese spheres of influence stands on its own merits, but also because of the significant implications they had for the scientific canon of the western world. These are at the same time histories that are intensely local but which also speak to the broader themes of the acculturation of scientific practices, and the organization of knowledge and expertise.

In her contribution, De Vos takes on a formidable challenge: to reconstruct the pharmacopoeia of the Nahua-speaking people of Mexico at the moment of the conquest. To do so she examined a handful of extant sources written during the early colonial era – no pre-colonial codices survive that discuss medical remedies – and found a striking lack of commonality between the sources, even when discussing pharmacological agents used to treat the same disease. This empirical finding led De Vos to some profound reflections about how historians of science approach such a task and the challenges it poses, such as those presented by translating across cultures and by applying western categories to a non-western and pre-Columbian context. To her this means questioning the conceptual categories of early modern *materia medica*, the very notion of disease, and how knowledge of medical remedies is created and transmitted in vastly different cultural contexts. This work yields a novel hypothesis about the highly localized nature of healing practices and pharmacopoeia in pre-Columbian Mexico.

Candiani's contribution comes to us from the perspective of environmental history, history of technological expertise, and material culture, and asks historians of science to reconsider certain historical categories such as colonialism, race, and nation-state that have informed early modern studies of colonization in the Americas and to reframe their work so that local conditions and dynamics come to the fore. Her article reaps the benefit of this perspective by first analyzing the range of technical skills necessary to undertake the *desagüe*, the ambitious 300-year task of managing the waters of the lakes of the valley of Mexico. This then allows Candiani to argue that the locus of this expertise lay in agropastoral groups and local builders, some indigenes, others not – this has little bearing on her story – working within a municipal structure designed to support the colonization enterprise. The story that emerges is not one of transplanted European know-how and imperial resources, but rather one whereby a coalition of urban elite and administrative interests working within an extraordinarily independent municipal government marshaled the necessary expertise and resources to achieve the goal of managing the waters that periodically threatened to submerge the ever-expanding city of Mexico.

These historiographical and research essays can only outline the present contour of historical studies of early modern science, medicine, and technology in the Iberian world. Yet they show how the field has responded to changing imperatives about what it means to write the history of science, medicine, and technology. They have adapted to current trends that encourage historians to make the whole world their canvas, but are also committed to telling local stories when the answers lie there. Whether or not these histories will ever become the building blocks of a grand narrative is not for us to say. But what the last ten years have shown is that science, medicine, and technology in the early modern Iberian world are too essential, too important, and too fascinating to ignore.

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