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'A dazzling cornucopia'
Professor Neil F. Safier, Brown University

NEW WORLD OBJECTS of KNOWLEDGE

A Cabinet of Curiosities

Edited by Mark Thurner and Juan Pimentel

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INTRODUCTION

Mark Thurner and Juan Pimentel

Unlike the items in Neil MacGregor's bestselling *A History of the World in 100 Objects*, our small cabinet's curious objects cannot be found in a single museum.[1] The reasons for this are several. First, from the late 15th century down to our own day, the New World, and in particular that part of it now called Latin America, has been plundered and pilfered for its 'treasures' and 'wonders' not by one conqueror, empire, explorer, collector or museum but by many. Consequently, many of its natural and cultural productions are scattered around the world, and in too many cases the provenance of the object has been lost. Second, the global nature of knowledge production has, since the 16th century, meant that everywhere objects have been removed not once but several times to new sites of study, storage and display. As a result, many key objects of modern wonder and knowledge have had several owners and keepers, indeed several 'afterlives'. Their histories and identities have often been lost, or remade, in the shuffle.

Our small cabinet of curiosities of New World objects is thus not a select inventory of any museum collection. It is instead the collective product of the Latin America and the Global History of Knowledge (LAGLOBAL) international research network. It responds to the LAGLOBAL charge to make accessible to the non-specialist reader knowledge otherwise difficult to access. With generous support from the Leverhulme Trust and, at turns, the network's several institutional partners (Institute of Latin American Studies, University of London; Centre for Amerindian, Latin American and Caribbean Studies, Saint Andrews; Department of the History of Science, CSIC, Madrid; Department of the History of Sciences and Health, Fiocruz, Rio de Janeiro; Department of Anthropology, History and Humanities, FLACSO Ecuador, Quito; Centre for Historical Studies, El Colegio de Mexico; Institute for Historical Studies, University of Texas at Austin; the John Carter Brown Library, Brown University), our purpose at LAGLOBAL is to advance and disseminate research on Latin America's frequently neglected and often invisible contributions to the global history of knowledge.

This portable cabinet squeezed between two covers is not an encyclopaedia. It consists of about 40 finely illustrated, eye-opening entries of 1,000–4,000 words that, each in its own way, attempt to capture the dynamic, often global itineraries of key New World objects of knowledge. Our object-images range from pre-Columbian codices to colonial portrait paintings, from enlightenment treatises to medicine cabinets, volcanoes and fossil bones. Any New World cabinet could house hundreds of objects or images, but our aim here is not to be comprehensive nor systematic. Like most historical

[1] N. MacGregor, *A History of the World in 100 Objects* (New York: Penguin, 2012).

cabinets, ours reflects the interests and contingencies of its collectors and keepers. In this sense, it is clearly the contingent product of the recent itinerary of the LAGLOBAL project. That itinerary has included a series of international workshops held in the museums, libraries and research centres of London, Madrid, Seville, Cadiz, Rio de Janeiro and Quito.

Our purpose here is not to prescribe how to read these objects but instead to gently encourage historical curiosity in readers with an eye for images and objects. In this regard, our little cabinet is not so unlike those early modern *gabinetes* (Spanish), *studioli* (Italian) or *Wunderkammern* (German). Indeed, we have thus modestly opted to mimic the traditional classificatory structure of early modern cabinets, dividing our objects into the questionable but historically significant categories of *artificialia* and *naturalia*. We do this with clear recognition that the 'natural' things in our cabinet are 'artificial' representations with specific histories.

Our further aim here is to incite critical curiosity about the New World as a key protagonist in the history of modern knowledge. A prime example of this curious but at the same time critical mix of the artificial and the natural, condensed in an object of New World knowledge, is the stunning *Quadro del Perú*.[2] This Hispano-Italo-Peruvian 'wall museum' or 'painted museum' is a veritable cabinet in itself. Like a museum, it embraces in a single work several genres or discourses of representation and transmission, including scientific and historical text, landscape, miniature portraiture and cartography, all in a framed exhibition that presents hundreds of niches or galleries of Peruvian naturalia and artificialia. It will serve us well in this introduction as a potent illustration of our purpose and method.

There have been and are many ways to interact with this object. It's perhaps easy to imagine all the people and animals depicted in the *Quadro del Perú* leaping out of their colourful frames and into our post-Google world of virtual galleries and video messages, in a sort of animated trompe l'œil. But can we imagine the reverse? If, like Alice in Wonderland, we could swallow a shrinking pill, step through the looking-glass and find ourselves in the underworld of the *Quadro*, what might we see and learn?

Despite the lacunae of the historical record, scholars have pieced together key elements and moments in the secret career of the *Quadro del Perú*. From its intercultural gestation in late 18th-century Peru to its purgatory in Madrid's colonial and museal offices and its more recent mass exposure on the Google Arts and Culture web platform, the *Quadro* has been a silent witness to a chiaroscuro history of enlightenment and ignorance. On the one hand, the *Quadro* is a brilliant tableau of the natural and cultural 'treasures' of Peru, a jewel in the crown of the Spanish Enlightenment, as its gilded frame unmistakably announces. On the other hand, this enlightened tableau of Peruviana is a spectre, a ghost, a haunting sign of loss and ignorance. First, properly understood, it represents the knowledge production not of the Spanish Enlightenment, as it is often read in Spain, but of the global and colonial Peruvian Enlightenment. Second, for most of its history it has gone largely unseen, in part due to bureaucratic contingencies and in part because the *Quadro* fits uneasily into dominant modes of aesthetic, scientific and museal classification. As an unseen, unsung and uncomfortable artefact of colonial enlightenment, the *Quadro* is a potent emblem for the LAGLOBAL project and an appropriate starting point for this New World cabinet of curiosities. As it turns out, the LAGLOBAL project and the *Quadro* share common goals. European ignorance of Peru was one of the primary motives behind the production and framing of the *Quadro*. Similarly, LAGLOBAL is devoted to recovering the lost knowledge of the Iberian New World or Latin America for the global history of knowledge, where it is too often ignored.

The primary intellectual author of the *Quadro* perished in the port of Cadiz in 1800 before he could embark for his adopted home in Peru. Most likely a victim of smallpox, he had only just completed and delivered the *Quadro* to the Secretariat of the Indies in Madrid. Born in Vizcaya, José Ignacio de Lequanda (1748–1800) had spent most of his productive life in Lima. There he played an important part in the collective academic project of the Sociedad Académica de Amantes de Lima (Academic Society of Patriots of Lima), whose most famous print

[2] J.I. Lequanda, *Quadro de Historia Natural, Civil y Geográfica del Reyno del Perú, año de 1799* (Madrid, 1799).

Figure 1. El Quadro de Historia Natural, Civil y Geográfica del Reyno del Perú, año de 1799 (*courtesy of the National Museum of Natural Sciences, Madrid*). *A high-quality image of the* Quadro *is available for viewing on the Google Arts and Culture platform: https://artsandculture.google.com/asset/quadro-de-historia-natural-civil-y-geogr%C3%A1fica-del-reyno-del-per%C3%BA-jos%C3%A9-ignacio-de-lequanda/igE86USP5Q1cYg?hl=es.*

legacy was the brilliant scientific, historical and literary journal the *Mercurio Peruano* (1791–4). As historian Victor Peralta has argued, the *Quadro* is an illustrated encapsulation of the spirit and letter of the Lima academic society's learned project and journal. The society included savants born not only in Peru but also in other parts of the vast Hispanic realm, including Italy and the Iberian Peninsula. From the very first issue, the *Mercurio Peruano* explicitly sought not only to enlighten Peruvian readers with scientific reports and historical essays about 'the country' but also to combat European ignorance about Peru's place 'in the universe' of science and letters, where it fared rather badly. Most European savants considered Peru to be a 'semi-barbarous' land of downtrodden peoples ruled by ignorant despots and inquisitors, and thus void of enlightenment.

The many illustrations that together compose the dazzling *Quadro*, drawn by Louis Thiébaut in Madrid from an archive of drawings and prints, paint Peru's place in the universe as one of unparalleled abundance, and useful knowledge of that abundance. The *Quadro* drew upon Peruvian concepts, sources and earlier illustrations, including the so-called *Trujillo Codex* (1782–5), assembled by native and *mestizo* informants, collectors and artists working under the direction of the bishop of Trujillo, Martínez Compañón, who in turn was responding to an official call to assemble objects of knowledge about Peru and submit them to Madrid and its Royal Natural History Cabinet, directed and founded by the Peruvian Creole Pedro Franco Dávila (see 'Creole Cabinet' in this volume). Other images found in the *Quadro* were derived from the Malaspina Expedition, one among the many notable global scientific projects associated with the Hispanic Enlightenment. In turn, that expedition had derived many if not most of its findings from Peruvian sources. In effect, the *Quadro* mixes its iconographic motifs from several genres, including casta painting (portraits of mixed-race couples) and the *mapas orlados* or *cartes à figures*, those ornate early modern maps in the Flemish tradition in which representative human figures of the territory populate the borders of the map.

What kind of artefact is the *Quadro*? The answer is not simple. Is it art? Is it science? Is it a painting? A book? A map? A gallery? A portable cabinet? A wall museum? Where does it belong? The *Quadro* is all these things, but it does not quite fit fully or comfortably into any one of them. The material of the *Quadro* is oil on canvas, which suggests it is a painting. It is distinguished, however, by its dimensions (331 × 118 cm) and composition: 195 scenes with 381 figures accompanied by an extensive explanatory text interspersed among the scenes, maps and landscapes. In addition, the framed canvas is crowned and gilded with twin cornucopias graced by a sheaf of arrows, symbolising the bounty of the New World or America under Hispanic monarchy. The two central geographical images (an east-up map of central Peru and below it a profile view of the rich new mines at Hualgayoc) form an axis that represents the new economic fulcrum point of 18th-century Peru, which had shifted from the southern mining region around Potosí to the central region adjacent to Lima. Notably, the central region encompassed coastal Lima and the new highland mines as well as the relatively undeveloped but highly promising Amazonian region to the east, thus uniting three major ecological and productive zones within a relatively short distance. In the *Quadro*, this vertical economic geography is represented by the unfolding of a concentric sequence of cells and niches populated by fishes and amphibians, small and large quadrupeds, and simians and humans – the latter divided in two classes, 'civilised' (or coastal and highland) and 'savage' (or Amazonian), with each composed of 16 'nations' or ethnic groups. Birds occupy the perimeter of the *Quadro*, seemingly lifting the entire canvas on their wings. The four corners are notably reserved for reptiles and insects, beings that, to be sure, had always occupied disquieting positions in the Great Chain of Being. Nevertheless, the *Quadro* is clearly not merely another iteration of the *scala naturae*, a Neoplatonist scheme that in the 18th century was twisted to serve racialist and supremacist thought in Europe. That twisting scheme had been energetically rejected in Peru by José Hipólito Unanue, an influential member of the Academic Society of Patriots of Lima. In its stead, Unanue offered an alternative vision of Peru as a land of unparalleled natural and cultural diversity that, in most ways, was more universal than Europe (see the 'Andes' entry in this volume).

The *Quadro* is a mimetic device that reveals in synoptic visual fashion what today would be called biodiversity and cultural diversity but which in Peru at the time was simply called the idea of Peru. This 'idea' was a well-developed notion evident in historiography, natural science and iconography. The idea was that Peru was culturally and naturally sovereign. Favoured by providence, geography and history, Peru lacked nothing. With its astounding vertical climatic diversity, Unanue and other *Mercurio Peruano* authors argued, Peru was the teeming home of more fauna and flora than anywhere else on the planet. This diversity could be put to productive use, transforming Peru into a prosperous cornucopia for the world. This desire to convey the exuberant nature of Peru is expressed in the irrepressible dispersion of text within the *Quadro* itself, which snakes through the Eden of Peruvian biodiversity depicted in the painted frames. Lequanda is the author of this snaking encyclopaedia, whose title is the name given to the *Quadro* as a whole: *Quadro de historia natural, civil y geográfica del Reyno del Perú, año de 1799*. His profuse text draws upon previous writings by the author, including learned essays published in the *Mercurio Peruano* and statistical reports on Peruvian political economy, prepared for Peru's viceroy and later submitted to the Secretariat of the Indies in Madrid along with the *Quadro* itself.

The teeming, cornucopian *Quadro* was in fact an emphatic argument, a polemical point of view in ongoing debates about the 'genius' and nature of the New World and about the status of the Hispanic American kingdoms 'in the universe'. At the time, many European savants held that in the New World, and particularly in the American tropics, nature was relatively young, humid and weak; the effects of this nature on people and civilisation were enfeebling or degenerative. Such 'enlightened' views had been preceded by the ancient Aristotelian and Ptolemaic traditions, in which the mythical 'torrid zone' or tropics was taken to be barren of life if not uninhabitable. In addition, by the late 18th century many European philosophes had argued that Peru was not a kingdom at all but a mere 'colony', unfit for self-rule, in part because, in their view, the effects of Peru's enfeebling clime were augmented by the cruel exploitation of ignorant and despotic Spain. The enlightened Peruvian authors of the *Mercurio Peruano* energetically rejected such ignorant views, arguing that Peru's history and natural resources demonstrated that she was in fact a sovereign, self-sufficient 'country' that had produced her own 'genius'. In this way, the *Quadro* was a powerful visual argument against condescending Northern European views of the tropical and subtropical New World. It directly countered European myths about the supposed ignorance and backwardness both of the Hispanic Empire at large and of Peru in particular.

At first glance, the *Quadro* appears to fall midway between an inventory and a collection or gallery of images – that is, somewhere between an Andean *quipu* (a mnemonic and narrative device of colour-coded, knotted cords; see 'Modern Quipu' in this volume) and Instagram. Like the former, it serves as an instrument for registering events and data; like the latter, it is a frame for displaying and sharing images. Lequanda was in fact an enlightened executive accountant or treasurer, not so unlike those Inca administrators, called *quipucamayoc*, who recorded in systematic fashion and in knotted, colourful strands the fruits and rents of Tawantinsuyu, the Quechua name for the Inca realm. The cadastral element of the *Quadro* aligns it not only with the quipu but indeed with the rich semantic field of the old Spanish noun that names it. According to the Real Academia Española, *cuadro*, which in the 18th century was typically written *quadro*, carries more than a dozen accepted meanings. Among these, the following six glosses are particularly relevant here:

> Pictorial composition on canvas, wood, paper, etc., normally framed; frame; in gardens, that part regularly cultivated in squares and adorned with flowers and herbs; description, written or oral, of a spectacle or event, so alive and animated that the reader or listener may represent in his imagination the thing being described; set of names, statistics or other data presented graphically, such that the relations among them are made evident; spectacle of nature, or group of persons or things, that offers itself to viewing and is capable of moving or terrifying the subject.[3]

Most of these senses of the word were anticipated in the frugal 1737 edition of the Royal Academy's dictionary, known as the *Diccionario de autoridades*, where *quadro* is given eight meanings.[4]

In short, *Quadro* is an ingenious, polysemic name that captures the multidimensional nature of our artefact. Indeed, *Quadro* would not be a bad title for this book if it were not for the fact that the term has fallen out of use. It thus comes close, for English readers, to the better-known French notion of *tableau*. For the French philosopher Michel Foucault, the *tableau* is a key device for ordering and classifying the world, a way of visualising it and making it apprehensible. We are reminded of the great works of Turgot or Condorcet, where *tableau* alludes to compendium or synopsis; of Alexander von Humboldt's *Tableau physique des Andes et pays voisins,* or indeed of his famous vertical profile or *Naturgemälde* of Chimborazo (see 'Andes' in this volume) in the *Geographie des plantes*.

Why was the *Quadro* presented in Madrid? And how did it end up hanging, as it does today, on an office wall in Madrid's National Museum of Natural Sciences (MNCN), out of public view? In a sense, the *Quadro* was for Lequanda personally, and the Peruvian Enlightenment collectively (although as we shall see this was problematic), a stunning calling card, a treasure of art and nature presented to the Secretaría de Hacienda de Indias in Madrid as visual proof of Peru's natural resources and political economy. Lequanda had left Lima for Madrid with a purpose. That purpose was to gain official appointment as the *contador del Reino del Perú* (accountant of the Kingdom of Peru), a lucrative and prestigious position that he fully deserved but was denied in Peru by the sitting viceroy, who had favoured his rival. This effort to gain appointment from the top required the deft use of connections and knowledge. Lequanda thus participated in several notable publication projects in Madrid that, in effect, disseminated or excerpted, often without proper citation, the writings and insights of the Academic Society of Patriots of Lima. The *Quadro* would be the more visible trace of his efforts, though eventually it too would become nearly invisible. For, like many

[3] Editors' translation from the Spanish. Real Academia Española, *Diccionario de la lengua española*, '*Quadro*' (Madrid: RAE), https://dle.rae.es/cuadro?m=form.

[4] Real Academia Española, *Diccionario de autoridades* (Madrid: RAE, 1737).

well-guarded and/or misapprehended treasures, access to the work has always been problematic. In its afterlife, the *Quadro* would become – and indeed it remains so today – a haunting spectre of the Hispanic-American enlightenment. It is precisely for this reason that the *Quadro* fits so well as the frontispiece and starting point of this book or 'cabinet', and as an emblem for the LAGLOBAL project as a whole.

We know that the *Quadro* was the property of the Secretaría de Hacienda de Indias from 1799 to 1836, when the secretariat was absorbed by the Ministerio de Hacienda (Ministry of the Treasury). The *Quadro* did not physically move premises until 1880, however, since the ministry occupied the same building as the old secretariat. The ministry was located adjacent to the Goyeneche Palace on the Calle Alcalá. That palace housed, under one roof, the Royal Cabinet of Natural History and the Fine Arts Academy of San Fernando. The *Quadro* was thus a silent witness to eight decades of the affairs of imperial officialdom, but at least it had admiring, if not jealous, neighbours. If the figures in the *Quadro* could step out of their niches and speak to us today, we might learn many state secrets otherwise lost to history. So many flies on the wall.

In 1880 the naturalist and historian Jiménez de la Espada petitioned the ministry to transfer the *Quadro* to the Museum of Natural History, successor to the Royal Cabinet of Natural History, located next door. 'Here,' the petition read wishfully, the *Quadro* 'may be displayed to the public under favourable conditions, such that it may be utilised for the benefit of science.' The ministry acceded to the request and, without crossing the street, the *Quadro* passed to the museum. But that was not the end of it. The expansive ministry had its eye on the museum's space, and soon annexed it. It was now necessary to dislodge the *Quadro* once again. This time, its fate was worse. After 1895 it became, together with much of the Natural History Museum's collection, a homeless wanderer, making its way from the Calle Alcalá to the storehouses of what is today the National Library, while many of the *Quadro*'s ethnological companion specimens ended up in Doctor Velasco's private museum (an anatomy theatre devoted to physical anthropology), which later became the National Museum of Anthropology. In 1910 the *Quadro* found a new home at the National Museum of Natural Sciences, which took up quarters in the Palace of Arts and Industry on the north side of Madrid, where both reside today. The *Quadro* would, once again, remain for the most part unseen by the public. But along the way it would garner the attention of one or two notable scholars and naturalists, including Francisco de las Barras de Aragón and Ignacio Bolívar. In the banner exhibition year of 1929 (the same year in which the Ibero-American Exposition opened in Seville and Barcelona), the *Quadro* made its appearance in a retrospective exhibit on natural history staged at the Royal Botanical Garden next to the Prado Museum. In 2005, the *Quadro* was finally declared by the state to be a *Bien de Interés Cultural* (Object of Cultural Interest), which permitted its restoration by the Spanish Institute of Cultural Patrimony. Since then it has been the object of several notable research projects led by the Spanish National Research Council (CSIC). Nevertheless, the *Quadro* is not normally on exhibit to the public (although it has been shown at several temporary exhibits in Madrid), according to the MNCN for preservation reasons. It hangs today on a poorly lit office wall behind the desk of the museum director's secretary. This is where the LAGLOBAL research team examined the *Quadro* during a workshop held in the museum in April 2017 (Figure 2).

Why is the magnificent *Quadro* still out of public view? The full answer to our query goes beyond questions of bureaucratic rivalry, lack of funding or preservation concerns. As we have suggested, the *Quadro* is true to its polysemic name; it is a mimetic and moving tableau of image, text and map that together invite the viewer to imagine and know, if not take possession of, a world named Peru. It fits uneasily into the categories of art or science as these concepts are understood today. The *Quadro* has not made its way into the Prado Museum, where both colonial American art and science have been effectively banned from the canons of the nation and art history. Ironically, the *Quadro* would have fit perfectly in the original Prado that never was. The Prado was never intended to be an art museum. It was designed by Juan de Villanueva for the enlightened monarch Charles III to house the Royal Cabinet of Natural History and a Spanish Academy of Science, thus complementing the Royal Botanical Garden next door. Today, the *Quadro* hangs uncomfortably and out of view in the National Museum of Natural

Figure 2. LAGLOBAL research team examines El Quadro del Perú *in the offices of the National Museum of Natural Sciences, Madrid (photo by Mark Thurner, April 2017).*

Sciences not only for preservation reasons but because it is not true 'science' by contemporary Spanish standards. Its digital afterlife on Google Arts and Culture is more heavenly than its extended museum purgatory. Removed from its materiality, history and institutional frames, the *Quadro* may now be examined and dissected piecemeal on any screen as 'art' and 'culture'. But the *Quadro* is somewhat out of place here as well since it is clearly not a 'masterpiece' by the standards of art history.

As the frontispiece of this cabinet-book, the *Quadro* serves as a telling, polysemic trace of the history of knowledge and aesthetics. Each object or set of objects presented and discussed in this volume by participating scholars of the LAGLOBAL project similarly serves as a telling trace of a history of knowledge and ignorance vis-à-vis the Iberian New World. It is by no means an exhaustive collection. All cabinets are subjective and dynamic affairs that reflect moments in the lives and interests not only of the collectors but of the wider networks within which they operate. By the same token, we welcome all visitors to this cabinet to encounter these curious objects on their own terms. Like Alice in Wonderland, we trust, readers will exercise their own experience and imagination in the face of what they find here.

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Part 1

ARTIFICIALIA

CODEX MENDOZA

Daniela Bleichmar

Many objects from the Americas that moved across distances and cultures in the early modern period left only tenuous traces in the documentary record, making it difficult for scholars to reconstruct what was thought of them in the past. An exception is the pictorial manuscript known as the *Codex Mendoza*, which produced a stunning wealth of documented responses. From the mid 16th to the mid 19th century (and beyond), the codex provoked descriptions, comments, questions and numerous reproductions that in their selective rendition of material created different versions of the document itself. Thus, the *Codex Mendoza* moved not only across space and time but also across languages, cultural categories, media, knowledge economies and interpretive horizons. Mobility made the *Codex Mendoza* flexible, unstable and prone to mutability – as was the case with other objects that moved across space and time. In various places and moments, readers turned the pages and pored over the images and the words, creating their own versions of the *Codex Mendoza*.

The *Codex Mendoza* is one of the earliest known post-conquest manuscripts created in New Spain. Produced in Mexico City, likely in the 1540s, it consists of a collection of paintings crafted by Aztec or Nahua painter-scribes (Nahuatl *tlacuilo*, pl. *tlacuiloque*) that were then glossed in detail and supplemented by a lengthy text written in Spanish by a legal scribe. The manuscript crossed the Atlantic soon after, perhaps as early as the 1550s. Ever since, it has been admired, cherished, coveted and pored over by scholars, collectors and enthusiasts. It was perhaps the best known and most studied Mexican manuscript in early modern Europe and, until the 1830s, the only Mexican document widely available for study through printed versions. It has functioned since the 17th century as a sort of Rosetta Stone for Mexican pictorial writing. Recent exhibitions have described it as one of the most important 'treasures' among the magnificent collections of the Bodleian Library at Oxford, where it has been held since 1659.

The manuscript is composed of 71 folios (leaves) of paper and measures roughly 30 x 21 cm (12 x 8 ¼ in). It consists of 72 pages of images annotated with Spanish glosses and 63 pages of textual commentary in Spanish. It is organised into three distinct sections. The first, in 16 folios, presents a political and military history of the Aztecs from the founding of the capital city of Tenochtitlan in 1325 to its fall in 1521. It is ordered chronologically according to the reign of each emperor or *tlatoani*, providing the dates of his rule through turquoise-coloured year glyphs and the names of the towns he brought into the imperial fold. The second and longest section, in 39 folios, relates Aztec imperial geography to economics. It details the tax obligations of towns subject to Aztec rule, catalogued by region and specifying the items they contributed, among them fine feathers, animal skins, precious stones, gold, mantles, liquidambar and cacao beans. The third section, which occupies

16 folios, describes life in the Aztec world: the upbringing of boys and girls from birth until age 15; various occupations and trades, including detailed depictions of military orders and their uniforms; and information about governance and customs. The manuscript provides a trove of details about precontact Aztec life.

The *Codex Mendoza* was produced through a complex process that involved multiple makers and a sequence of steps. First, Nahua painter-scribes created the pictorial content. They used for the most part pre-Hispanic pictorial conventions, though some of the images employ European elements. Then, following local custom, these figures provided the basis for a spoken account in Nahuatl that explained their meaning and augmented their content by supplying details that went beyond the pictures. In a third step, Spaniards entered the process: a Spanish interpreter fluent in Nahuatl (a *nahuatlato*) provided a Spanish-language oral interpretation. Then, a Spanish scribe took down the recitation to compose the lengthy textual passages. At some point, the scribe annotated every individual figure with a brief Spanish gloss that translated image into text and, often, Nahua concepts into Hispanic ones. Finally, the scribe composed a closing statement that revealed details about this process and highlighted the complexities of translation. Thus, while the work is customarily described as an illustrated manuscript, it can more accurately be considered an extensively annotated collection of drawings.

As a result of the complex, multistep process of manufacture, which engaged Nahua and Spanish participants, concepts and elements, the *Codex Mendoza* is an inherently transcultural object. It combines elements from at least two distinct traditions of the writing and representation of history. Nahua aspects include the pictographic writing and oral account, the artists and narrator, the pigments used in the figures and the information contained in the document. Old World aspects include the imported Spanish paper and ink, the book format and adherence to the page as the dominant structural unit (as opposed to the use of a pre-Hispanic format, such as the screenfold, scroll or painted cloth), the alphabetic writing, the scribes and the intended audience, as the document is believed to have been created for readers beyond the shores of New Spain. The *Codex Mendoza* can be understood as the product of a series of translations: rendering images into words, Nahuatl into Spanish, oral interpretation into alphabetic writing and preconquest indigenous history into a version framed within the context of post-conquest viceregal society and produced expressly for European viewers and readers.

When the initial translations in medium, language and cultural framing ceased and the codex was complete, its physical transport began. Apparently finished in haste, the codex travelled by land from Mexico City to the gulf port of Veracruz and there boarded a ship that carried it across the Atlantic. Once set in motion, it continued to circulate for the next hundred years to destinations its makers never imagined. During that period, it changed hands multiple times and was a prized possession of some of the most noted European collectors and travel writers. It is unclear whether the codex ever reached Spain, and also unclear how it ended up in the hands of its first recorded owner: André Thevet (*c.*1516–90), a French traveller and author of books on the Americas, royal cosmographer to the Valois court. By 1587, it appears, the codex had passed to Richard Hakluyt (*c.*1552–1616), an active promoter of English settlement in North America and the author of two important compilations that approached geography and travel from the perspective of English political aspirations towards the New World. After Hakluyt's death in 1616, the manuscript went to Samuel Purchas (*c.*1577–1626), an English cleric and the author of an immensely popular travel compilation that would be of great importance to the codex's early modern reception. After Purchas's death ten years later, the English jurist, politician, scholar and collector John Selden (1584–1654) acquired the manuscript. Finally, after Selden's death in 1654, his extensive collection of over eight thousand books and manuscripts went to the Bodleian Library at Oxford – it took five years to complete the transaction, but by 1659 at the latest the *Mendoza* had reached the institution that has held on to it ever since, marking the end of its physical travels. Remarkably, the *Mendoza* has the very first shelf mark and catalogue entry among the Bodleian's collection of more than 350 notable manuscripts from Selden: Manuscript Selden A.1.

Although the *Codex Mendoza* has never left the Bodleian Library since its arrival, it continued to

Figure 1. The Codex Mendoza, c. *1541, Mexico City, folio 2r. Manuscript Selden A.1., Bodleian Library, Oxford (public domain).*

Table 1. *Publications Presenting Material from the* Codex Mendoza, *1625–1831*

1.	Purchas, S. (1625) *Hakluytus posthumus, or Purchas his pilgrims* (London).
2.	de Laet, J. (1630) *Nieuwe Wereldt ofte Beschrijvinghe van West-Indien*, 2nd ed. (Leiden).
3.	de Laet, J. (1633) *Novus Orbis seu descriptionis Indiae Occidentalis* (Amsterdam).
4.	de Laet, J. (1640) *L'Histoire du Nouveau Monde ou description des Indes* (Leiden).
5.	Kircher, A. (1652–4) *Oedipus Aegyptiacus* (Rome).
6.	Thévenot, M. (1663–96) *Relations des divers voyages curieux* (Paris).
7.	Warburton, W. (1738–41) *The Divine Legation of Moses Demonstrated* (London).
8.	Warburton, W. (1774) *Essai sur les hieroglyphs des Egyptiens* (Paris).
9.	Clavijero, F.J. (1780–1) *Storia antica del Messico* (Cesena).
10.	von Humboldt, A. (1810–13) *Vues des Cordillères, et monumens des peuples indigenes de l'Amérique* (Paris).
11.	King, E. [Viscount Kingsborough], (1831) *Antiquities of Mexico, Comprising Fac-similes of Ancient Mexican Paintings and Hieroglyphics,* vol. 1 (London).

move – not physically but through publication. Its paper travels began with Samuel Purchas's widely read *Hakluytus Posthumus: Or, Purchas His Pilgrimes*,[1] which includes a 52-page chapter on the *Mendoza*, reproducing the original and adding commentary. Purchas explained that although his book introduced the letters of other modern and ancient nations, including Chinese, Japanese, Indian, Arabic and Persian, as well as Egyptian and Ethiopian hieroglyphs, this precious Mexican manuscript was the only known full-fledged history of and by a foreign nation, addressing their rulers, economics, religion and customs. For Purchas, the *Codex Mendoza* represented much more than a collectible example of exotic writing: it constituted a unique indigenous source about the Aztec world.

Indeed, the *Mendoza* was extraordinary at that moment. A small number of pre- and postconquest Mexican manuscripts were then held in various collections across Europe, but nobody knew how to make sense of the former and almost nobody saw the latter. The Spanish-language text made the *Mendoza* one of the very few Mexican manuscripts that Europeans found legible. The fact that it was a history – a highly regarded genre at the time – mattered greatly to Purchas's assessment of the codex, helping to prove Aztec governance and civility and to establish the Aztecs as a sophisticated civilisation. Purchas's high esteem for the manuscript is evidenced by the decision to reproduce it almost in its entirety, which involved having the Spanish text translated into English and also commissioning a large number of woodcut reproductions of the figures, a laborious and costly choice. Indeed, no other American manuscript was publicly reproduced in print in its entirety before the 19th century.

Purchas's version of the *Codex Mendoza* had enormous impact. Between 1625 and the publication of Lord Kingsborough's nine-volume *Antiquities of Mexico* (1831–48),[2] Purchas's print translation provided the source material for no fewer than six other titles in nine different editions, many of them influential and widely read works (Table 1). For two centuries, the numerous authors who wrote about the *Mendoza* based their information and images on Purchas's edition, and to a lesser degree on later publications based on it. This meant that they knew the pictographs as black-and-white woodcuts rather than as vividly coloured drawings, and that they did not fully realise the Spanish textual presence. Still, thanks to Purchas, the *Mendoza* may well be the single most reproduced and studied New World manuscript.

[1] S. Purchas, *Hakluytus Posthumus: Or, Purchas His Pilgrimes* (London, 1625).

[2] E. King, *Antiquities of Mexico, Comprising Fac-similes of Ancient Mexican Paintings and Hieroglyphics* (London, 1831), vol. 1.

Print not only gave the *Codex Mendoza* legs but it also made it malleable. Authors provided various interpretations of the material and its significance, creating in effect multiple versions of the codex as they used it to pursue discussions about history, religion, pictographic writing, the civility of New World populations, the history of languages and other topics. The first to draw on Purchas's *Mendoza* for his own publication was Johannes de Laet (1581–1649), the Dutch geographer, author and founding member of the Dutch West India Company, who included it in various editions of his popular *New World, or Description of the West Indies*.[3] De Laet reproduced a very limited number of the many images in Purchas's publication, focusing instead on the information the document provided about Aztec history in order to compare this indigenous source to the writings of Spanish authors, pointing out inconsistencies. For his part, the French orientalist Melchisédech Thévenot (*c.*1620–92) included in his own publication 47 pages of printed images copied from Purchas's woodcuts, followed by a French translation of Purchas's English translation of the original Spanish, itself a translation from the Nahuatl. Thus, while Purchas had laboriously reproduced the pairing of image and text in his printed book, Thévenot dissociated the two elements and privileged the images as examples of non-European writing. Notably, Thévenot's version opened not with the depiction of the foundation of the imperial Aztec capital of Tenochtitlan – as the codex itself does and Purchas also did – but rather with a view of Moctezuma's palace, which in the manuscript appears only towards the end. By focusing on the depiction of royal authority as a representation of Aztec imperial history rather than on the calendrical or numerical figures that so interested other interpreters as instances of hieroglyphic writing, Thévenot's frontispiece suggested greater similitude between European and Aztec traditions. Another author to examine and reproduce Purchas's version of the *Mendoza*, the Jesuit polymath Athanasius Kircher (1602–80), used it in his *Oedipus Aegyptiacus* as evidence to support his belief that the Mexican pictographs were in fact hieroglyphs demonstrating the spread of Egyptian culture throughout the world in ancient times.[4]

Detained in the library, the *Mendoza* continued to move in print. It was included in travel collections as a source on Amerindian civilisation. It provided material for the comparative study of cultures, religions, languages and writing systems. It was recruited into discussions surrounding European colonial and commercial expansion and competition. It served antiquarians and collectors. It allowed for evolutionary arguments about the relative civility or primitivism of various cultures. And on and on, multiplying with astonishing interpretive malleability. Between 1625 and 1830, the codex's printed translations produced numerous distinct versions, multiplying the object through interpretation while the manuscript itself remained for the most part out of sight, hidden away in the library. These translations, reproductions and re-evaluations continued over the course of the 19th and 20th centuries, as the *Mendoza* (along with other early colonial and preconquest objects) entered discussions concerning the role of the Aztec past in the making of modern Mexico. In recent years, the *Codex Mendoza* has been described as a treasure. A jet-setting star of international exhibitions, it has been admired by audiences in London, New York, Los Angeles and beyond. And reproductions continue to offer powerful interpretations about the meaning and importance of the original manuscript: the digital edition published in 2015 as a collaboration between the Bodleian Library and Mexico's Instituto Nacional de Antropología e Historia (INAH) was described as a 'virtual repatriation'.

[3] J. de Laet, *Nieuwe Wereldt ofte Beschrijvinghe van West-Indien*, 2nd ed. (Leiden, 1630).

[4] A. Kircher, *Oedipus Aegyptiacus* (Rome, 1652–4).

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MACUILXÓCHITL

Juan Pimentel

There is a passage in the *Historia general y natural de las Indias* (1526–57) in which the chronicler Fernández de Oviedo complains that words are inadequate to describe the natural wonders of the newly discovered lands.[1] In his opinion, the New World needed the masterful eye and hand of a Berruguete, a Leonardo or a Mantegna. As we look at this graphic image of Macuilxóchitl, we see not a Renaissance painting nor a modern map but something stranger. We see an ox and a horse seemingly heading upriver, floating churches and three seated human figures deep in conversation. It is for us a dreamlike image which only needs a leaning fiddler to complete a work of Chagall, the famous surrealist painter. Our tendency to see this picture as closer to a work of art than to a scientific document is not merely a consequence of our familiarity with Chagall's neo-primitivism; it also follows from our rather limited understanding of what constitutes knowledge.

This picture of Macuilxóchitl forms part of an iconographic corpus of local knowledge typical of the so-called hybrid, or *mestizo*, painted maps of New Spain produced in response to the official questionnaires used to compile the *Relaciones geográficas* or *Geographical Accounts of the Indies*. The corpus includes some 75 maps distributed between the General Archive of the Indies in Seville, the Benson Library at the University of Texas at Austin and the Royal Academy of History in Madrid, from which our example comes.

The origin of these painted maps reaches back to the 1570s, when López de Velasco – the senior cosmographer of the Council of the Indies, the advisory body charged with managing imperial affairs – drew up questionnaires that were sent to officials in all corners of the Indies, including Hispanic America. The council wished to compile information about the natural resources, inhabitants and environmental conditions of the realm. Some of these questions were astronomical and geographical, relating to the precise locations of towns and villages (altitude, observation of stars and eclipses, distances in leagues between settlements, etc.). Others specifically requested 'outlines, drawings or painted figures' of communities and territories. With this information López de Velasco intended to compile an atlas of the New World. However, as often happens in such endeavours, the interrogator's questions generated unanticipated responses. The history of intercultural exchange is full of misunderstandings. So, while the council requested astronomic positions, data, observations, hydrography and geometry, some local authorities commissioned drawings or paintings from those who were most familiar with the art of illustration and had local knowledge of the environment: the *tlacuilos*, 'painters' or 'scribes'

[1] G.F. de Oviedo, *Historia general y natural de las Indias* (Seville, 1535–57).

Figure 1. Painted map of Macuilxóchitl (courtesy of Real Academia de la Historia, Madrid).

in Nahuatl, either members of the native elite or answerable to them. There was logic in this decision, since – as Barbara Mundy notes in her classic study – while the Spaniards were the masters of the written word, the realm of the image belonged to the native inhabitants, whose manner of recording or writing was to a large extent visual, dominated by logograms, glyphs and pictograms.[2] Between the word and the image was a space of creative translation capable of producing a documentary record that may have presented challenges to its interpreters.

Macuilxóchitl was a small village in the diocese of Antequera in the province of Oaxaca. The painted map was created in April 1580 in response to the instructions issued by the Council of the Indies. The picture is, by our aesthetic standards, bleakly beautiful. The first thing we may notice today is how Euclidian geometry, astronomical observations, parallels and meridians are irrelevant to its composition. So too is the technique of perspective, that successful device of the quattrocento for locating objects in space. Here the animals and churches appear to float, as do the roads and the river, which seem to tie themselves in knots in the air. The inverted anthropomorphic sun on the right, the radial layout of the settlements following the customary conventions of the positioning of the church and the walled enclosures: everything flows in the enveloping momentum that art historian Alessandra Russo has so aptly named 'circular realism'.[3]

Let us look closer at the glyph (the figure or symbol) drawn in the centre of the picture or painted map. Representing the name of the place depicted in the map, this central image is a toponymic glyph for the *altepetl*, here crowned with a crucifix. The altepetl or 'water mountain' was the basic unit of Nahua settlement, an ethnic or kin-based territorial concept that the Spanish translated successively as city, city-state, town, *señorío* (manor or domain) and even empire. Inside the water mountain, the *tlacuilo* has drawn a bush with five flowers, each with five petals: in Nahuatl this is read as *macuilli xóchitl*, or 'five flowers'. Macuilxóchitl was a Mexican calendar god, associated with games and music, otherwise known as Xochipilli, the prince of flowers and fertility. He was also associated with the spirits of men fallen in battle, with sacrifice and regeneration. However, this god is not represented here. The glyph appears to have no meaning beyond its function as an identifier, purely toponymic or demonstrative, although of course it is marked with a cross. Today's tourist maps would say 'You are here', or simply 'The name of this place is…'.

Recent archaeological research has identified this promontory as the Cerro Danush, an important Zapotec religious centre, a sacred mountain next to the town of Quiyebelacayó – 'five roses' in Zapotec, perhaps alluding to five rocks which housed the earlier sanctuary. This name figures in the extensive caption of the painted map, to the left of the central glyph, written in Latin characters but in the Nahuatl language, which in turn registers the Zapotec past of the locality, still very apparent at the end of the 16th century (indeed, in San Mateo Macuilxóchitl, Zapotec is still spoken). We know from this caption and from the questionnaire prepared by the *corregidor* or magistrate of the area, Gaspar Asensio, that the two male figures and one female figure depicted in the glyph are Coqui Pilla (Snake Lord or Rabbit Lord), Coqui Piziatao (Golden Eagle Lord) and Yoci Xonaga Bela Laa. These two lords or chiefs are each seated on an *icpalli*, a seat of woven palm that signals their importance; she wears a band on her hair and sits on her heels. Apparently, these three Zapotec nobles (called *tlatoque* in Nahuatl) had usurped the land from the lord of Macuilxóchitl, who had in turn received it in an earlier gift from the lord of Teozapotlan, a nearby locality. The caption states that 'one night, like thieves, the three Zapotecs stole the land from the lord of Macuilxóchitl'.

We do not know for certain the identity of the artist. It is possible that the artist was one of the five elders of the town mentioned in the *Relaciones geográficas*. Or perhaps it was the interpreter Juan Pérez, who served as the intermediary between the five representatives of the local community and the six Spanish authorities brought together by Gaspar Asensio, who was to guarantee the reliability of what

[2] B. Mundy, *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geográficas* (Chicago, IL: University of Chicago Press, 1996).

[3] A. Russo, *El realismo circular: tierras, espacios y paisajes de la cartografía indígena novohispana, siglos XVI y XVII* (Mexico: UNAM/Instituto de Investigaciones Estéticas, 2005).

Figure 2. Painted map of Macuilxóchitl, detail (courtesy of Real Academia de la Historia, Madrid).

was written and depicted. Whoever the artist was, the painted map is clearly making a historical claim on the site. In short, the painted map describes historical deeds or events as well as spaces or places.

But let us move out from the central glyph to explore the surrounding territory. Spreading below the feet of the three Zapotec *tlatoque* is the main village of Macuilxóchitl (indicated by the walled citadel around the church with its three bells) and the three *teopans* (monasteries) of Tlacochahuaya, San Francisco and San Juan. Making up the landscape are several species of plants and livestock.

There are agaves and prickly pears, the two quintessential Mexican plants from which are extracted foodstuffs, drinks, balsamic oils and medicines. Among the trees, some appear to be imported quinces or figs. Others are native fruit trees, such as avocados and guavas. Among the crops depicted, one looks like maize, another tobacco. All these species of plant are mentioned in the *Relaciones geográficas*. In a figurative rather than systematic way, the painted map complements or confirms the textual information in the questionnaire about botanical materials, medicinal practices and agricultural products.

Perhaps the most striking visual and narrative element of the painted map is the nine hoofed quadrupeds: an ox, a horse, a cow with three calves and a small flock of three sheep, one of which is nibbling on a prickly pear. These are, or for a time at least were, strange domesticated animals, as exotic to America as llamas or turkeys were to Europe. At any rate, the tlacuilo has chosen to depict Old World livestock in the territory in what appears to be a rather domesticated fashion. Were these livestock also considered usurpers, like the Zapotec lords? Or were they signs of a new prosperity for those who had survived the initial ravages of disease and war and now found solace for their altepetl under the sign of the holy cross? The *Relaciones geográficas* is not clear on this matter. What is clear is that this masterful landscape painting is also a historical chart of past and unfolding events, of territorial claims and environmental transformation.

The new environmental history of post-conquest Mexico would suggest that these voracious animals of the Old World wreaked havoc in the New. Grazing did not exist in Mesoamerica before the arrival of Spaniards. With the abundance of food and the rapid decline of human populations due to disease, livestock multiplied exponentially, changing the environment. The tlacuilo of our picture records this transformation of the countryside. According to Castilian tradition, pastures and grassland not cultivated for agriculture were recognised as common grazing land, an idea which seems to have swept across Macuilxóchitl, devouring its natural resources. The animals' tracks are visible on the roads, after the footprints of the natives. There are at least two types of track, some with horseshoes, others without. These hoofprints sum up the itinerary of the animal occupation and colonisation of agrarian space formerly peopled by peasants but still ruled to some extent by native spatial concepts, chiefs and gods.

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POTOSÍ

Kris Lane

Although the exhilarating Spanish catchphrase *vale un Potosí* (roughly, 'that's worth a fortune') is still alive today, the tremendous significance of Potosí in global history has faded from modern memory. The Imperial Villa of Potosí and the iconic mountain of silver that towers over it, called Sumaj Urku or 'Beautiful Mountain' in Quechua and in Spanish Cerro Rico or 'Rich Hill', were once home to one of the world's largest cities, industrial complexes and silver mines. The city in its early 17th-century heyday boasted a cosmopolitan, multicultural population that rivalled London's. Those who could not visit the Imperial Villa found their own Potosí in the form of a woodcut, engraving or painting.

Apparently discovered in 1545 by an Andean prospector named Diego Huallpa, the Cerro Rico, an eroded volcanic plug jutting up 4,782 m or nearly 16,000 feet above sea level, quickly captured the world's imagination. Beneath its red and ochre surface, miners dove straight underground chasing half a dozen major and over a hundred minor vein systems, all phenomenally rich in silver. In the first decades, heavily oxidised ores were smelted in llama-dung-fired indigenous furnaces called *guairas*, borrowing the Quechua word for wind. Aligned up and down the ridged hills surrounding the city, several thousand guairas burned through the night thanks to katabatic breezes, the brisk downdrafts that came on at sunset (Figure 2). Invisible in the dark was the toxic blue smoke of lead flux that descended into populated valleys and ravines.

As the mines plunged deeper, enriched and friable surface ores gave way to harder, sometimes refractory ores, grey-to-black rocks containing plenty of silver but requiring more sophisticated methods of milling and refining. These ores, often containing zinc, lead and even tin, resisted smelting in the guairas, so it was only with the construction of large-scale mercury amalgamation facilities after 1572 that the silver potential of these ores was unlocked. Amalgamation required large, water-powered crushing mills, which put a premium on wood but also required the creation of an extensive system of reservoirs and canals in the neighbouring Kari guarantor mountains. Over a hundred stamp mills operated along Potosí's main gulch by the early 1590s, when the mines reached peak production (Figure 3).

Borrowing techniques developed in Mexico's Pachuca mining district in the 1550s, Potosí refiners had native Andean workers blend pulverised ore with salt and mercury in large open-air bins, sometimes heating the mixture to speed amalgamation. Workers and overseers experimented with other reagents in response to varying ore chemistry. Resulting blobs of amalgam were collected, washed and fired in a still-like retort to drive off liquid mercury, much of it recovered through condensation for reuse, although some escaped to foul the air and poison workers. The result was a pure silver ingot called a *piña*, or pinecone, several of which were smelted to make 60–80 lb bars for assay and taxation. The new mercury

Figure 1. Francisco J. Mendizábal, Cerro Rico and Villa Imperial de Potosí with reservoirs supplying water to mills, c.*1755–75 (courtesy of Museo del Ejército, Toledo, Spain).*

refining process swelled the city's population, sped deforestation and vastly increased air and water contamination, with acid mine drainage adding to the damage (Figure 4).

The introduction of mercury amalgamation caused Potosí to boom on a scale never before seen in world history. Cerro Rico silver flowed into ships' holds in the form of brick-sized bars (Figure 5) and, after 1574, coins, the famous pieces of eight that lubricated world trade, particularly between Europe and Asia (see 'Piece of Eight' in this volume). Peru's viceroy Francisco de Toledo (1569–80) is rightly credited and blamed for this quasi-industrial transformation of Potosí, attested to by soaring tax returns and Spanish government spending. Production peaked in 1592, after which the Cerro Rico began to lurch along in stair-step decline, a trend reversed only in the 1730s (Figure 6).

The cost of the Cerro Rico's bonanza had to be reckoned in blood as well as silver, since the same viceroy who introduced amalgamation also formalised and vastly expanded the Andean labour draft known as the *mit'a*, or 'turn'. Maimed or sickened, many young Andean men did not go home when their turn was up, having served in the mines, the refining mills and many other tasks, including maintenance of the vast reservoir and canal system also implemented by Viceroy Toledo (see Figure 1). Many who survived the mit'a stayed on to work for wages, and many Andean women, including mine

Figure 2. 'These Indians are guayrando', c.*1603 (courtesy of the Hispanic Society of America, New York).*

Figure 3. The Cerro Rico with a water-powered stamp mill and amalgamation bins in the foreground, c.*1603 (courtesy of the Hispanic Society of America, New York).*

Figure 4. Detail from Gaspar Miguel de Berrío showing refining mills along the Ribera gulch, 1758 (courtesy of Museo Colonial Charcas, Sucre, Bolivia; photo by X.M. Lane).

Figure 5. A c.40 kg Potosí silver bar from the 1622 wreck of the Atocha *off the Florida Keys (courtesy of Daniel Frank Sedwick LLC, Auction 14, Lot 304).*

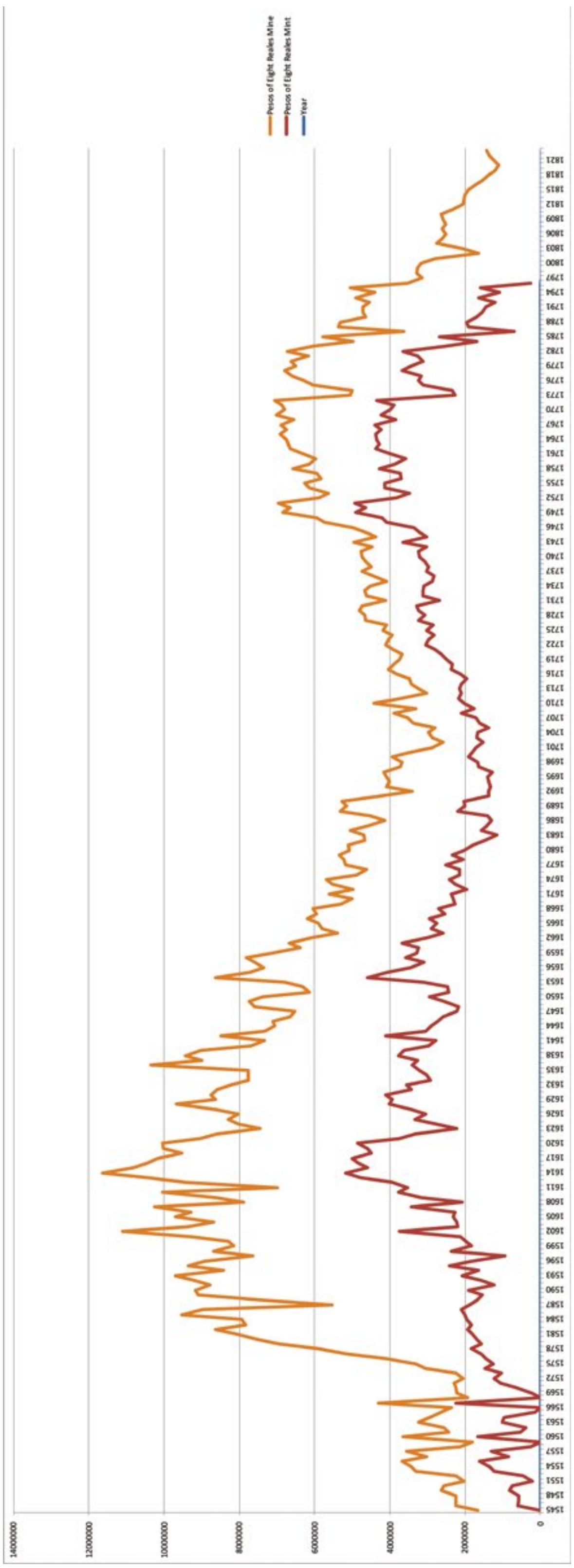

Figure 6. Potosí's registered silver production (yellow) and mint production (red) from discovery in 1545 to 1821.

widows, stayed in town to provide rotating armies of workers with *chicha* (maize beer) and hot meals. Some women and even children survived by sorting ores near the mouths of the mines, paid a pittance for hard and dirty work at extreme altitudes.

A workers' life and death camp, with indigenous townships crowded around the base of the mountain, the boomtown of Potosí was also a voracious consumer of all manner of goods, many of them arriving from the far corners of the earth. Food, drink and fuel came mostly from the near hinterland, but ready silver turned the isolated Imperial Villa into an overnight emporium of astonishing variety. Though harder to reach than Timbuktu and higher than any city in the world, Potosí quickly became a prime market for stimulants such as coca, tobacco, chicha, wine and yerba maté; spices such as pepper, cloves, cinnamon and saffron; and fine textiles including satin, damask, taffeta and velvet. Premium woollens came from England and Holland as well as Spain. The broadcloths of Segovia were especially esteemed for their high thread count. Fine linens arrived from Ireland and France as well as the Low Countries. Silks at first came from Italy, but also from Granada and (briefly) Mexico.

A wave of cheaper luxury fabrics reached Potosí from China after the opening of the Manila galleon traffic in 1571, along with Indian muslins, blue-on-white porcelain, Japanese lacquerware and religious carvings in African ivory made by Chinese craftsmen in Manila. In this proto-industrial city that ran around the clock, the mines and refineries consumed vast quantities of Basque and later Swedish iron and steel. Scribes recorded baptisms, dowries, sales and much more on high-quality Genoese paper. Professional painters, sculptors and silversmiths copied religious masterworks from Flemish engravings. Books flowed into the imperial city mostly from Iberian presses (Madrid, Seville, Lisbon, Valladolid, Barcelona), but others came from Italy, the Low Countries, Lima and Mexico City. One could purchase a variety of world maps and city plans as well as epic histories of 'The Great Turk' or 'The Kingdom of China'. Portuguese, French, Italian and Flemish merchants sold Venetian glassware, along with 'Muscovy' saddles, Bohemian knives and German eyeglasses. The list of global imports was long, and soon after Toledo's industrial revolution it even included fake silver thread or tinsel from Florence.


Parte primera de la

CERRO DE POTOSI

S. FRANCISCO

SANTA BARBARA

LAs minas de Porco, y otras que se hã visto enestos reynos muchas dellas desde el tiempo de los Ingas estã abiertas y descubiertas las vetas de donde sacauã el metal: pero las q̃ se hallaron eneste cerro de potossi (de qu.ẽ quiero agora screuir) ni se vio la riqueza que auia, ni se saco del metal hasta que el año de mill y quinientos y quarenta y siete años, andã do vn español llamado Villarroel con ciertos Indios abuscar metal q̃ sacar, dio enesta grandeza q̃ esta en vn collado alto d̃la postura que aqui va figurado: el mas hermoso y bien assentado q̃ ay en toda aq̃lla comarca. Y porque los Indios llaman Potossi a los cerros y cosas altas, quedosele por nõbre Potossi, como le llamã. Y aunque en este t.ẽpo Gonçalo Piçarro andaua dando guerra al visorey, y el reyno lleno de alteraciones causadas desta rebellion, se poblo la falda deste cerro: y se hizierõ casas grãdes y muchas: y los Españoles hizieron su principal assiento en esta parte: passandose la justicia a el: tanto que la villa estaua casi desierta y despoblada. Y assi luego tomaron minas, y descubrierõ por lo alto del cerro cinco vetas riquissimas: q̃ nombrã veta rica, veta del

Figure 7. Pedro de Cieza de León, Cerro de Potosí *(Seville, 1553; courtesy of John Carter Brown Library at Brown University).*

Potosí also became a major Andean slave market soon after discovery, first connected to West Africa via the long route from the Caribbean to Panama, Lima and Arica (Chile). By 1590 more enslaved Africans arrived from West Central Africa via Córdoba (Argentina), Buenos Aires and Rio de Janeiro. Enslaved African women worked in almost all the Imperial Villa's elite households, and many sold hot foods on the streets and squares. Enslaved men mastered trades and manned workshops in addition to driving mules, overseeing mills and staffing the royal mint. African children served as pages and errand runners. The city's town criers were nearly all Black men.

By the time silver production peaked in 1592, the Imperial Villa of Potosí was a global city with a population nearing 100,000 and growing. It was still less than 50 years old; there had been no pre-Columbian settlement on this high, alpine slope. Yet well before its post-1572 take-off, Potosí's Cerro Rico had become a secular and sacred symbol of wealth and empire. The first iconic image appeared in the chronicle of Pedro de Cieza de León (Figure 7).

After crossing the Atlantic from Spain, Cieza made his way from what is today Colombia's Caribbean coast all the way overland to Potosí, which he visited in 1549. The improbable city, still small and not yet graced with royal blessings, amazed him. Yet it was the Cerro Rico that really stood out for Cieza. He sketched the mountain and the town and delivered the sketch along with his manuscript to a publisher in Seville. The 1553 woodblock engraving that resulted soon circled the world, to be copied and altered to match the desires and fantasies of princes, investors and would-be discoverers (Figure 8).

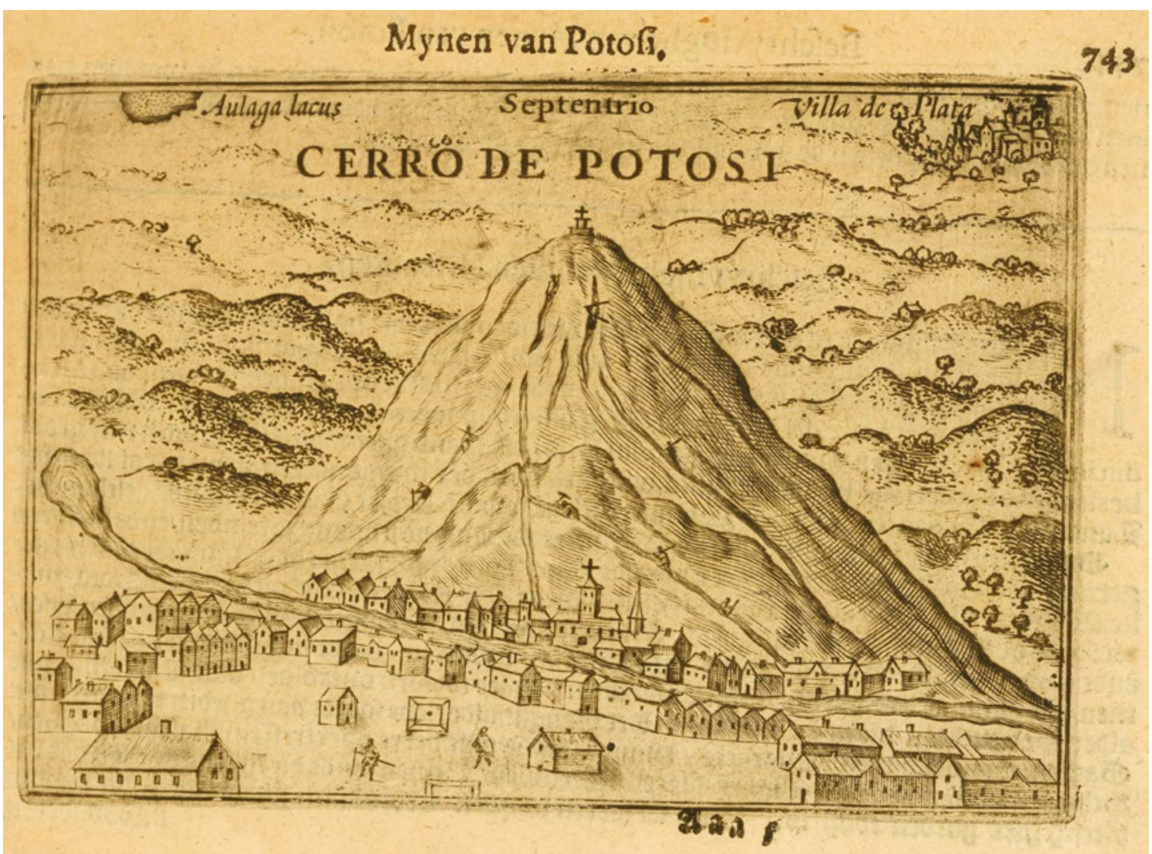

Figure 8. English rendering of Cieza's Cerro Rico, 1581, as frontispiece for a translation of Agustín de Zárate's Discovery and Conquest of the Provinces of Peru *(courtesy of John Carter Brown Library at Brown University).*

Figure 9. Tarih-i Hindi-i Garbi, c.*1580 (courtesy of the Newberry Library, Chicago).*

Cieza de León's spare rendering of the Cerro Rico and Imperial Villa spawned numerous imitators, some of them hewing close to his original and others exaggerating or distorting certain features. Perhaps the most astonishing image of Potosí's Cerro Rico comes from the Ottoman manuscript known as the *Tarih-i Hindi-i Garbi*, a compendium of descriptions and histories of 'the Indies' produced in Istanbul beginning in the late 16th century (Figure 9).

Western Europeans obsessed with Spanish mineral treasure also carried on the tradition of publicising the coveted place they had never seen. The renowned Flemish engraver, publisher and anti-Hispanic propagandist Theodor de Bry never visited Potosí, or America for that matter, but he wished to render its underground world visible for his many curious readers. Based on his understanding of the work of Spanish Jesuit José de Acosta, who had personally visited Potosí in the 1580s, de Bry created what may be the most reproduced image of the Cerro Rico after Cieza de León's.

Viewers of this 1601 image (Figure 10) from the multivolume *History of America* may take it as a generic, stylised picture of mining, but it is clear from the details that de Bry was following Acosta's written description. The workers climbing up and down the fixed rawhide ladder are just as Acosta describes them. The ore sack 'backpacks', the candles held in one hand by only some workers, even the llamas barely visible above right and below left, where there is also a water-powered ore-crushing mill, all follow Acosta's words.

We know that a huge amount of Potosí silver had reached China by the last quarter of the 16th century, and by around 1600 the traffic showed no signs of abating. Living at the Ming court in Beijing, Jesuit Matteo Ricci made a point of informing his audience of eunuchs about the riches of America. His 1602 world map, engraved by his assistant Li Zhizao and based on a Waldseemüller print, covers an entire wall. China is in the middle, of course, and America is on the far right. Positioned more or less in the centre of South America is a small mountain range with characters that read 'Bei Du Xi Shan' or 'Potosí Mountain' (Figure 11).

Native Andean views of Potosí's Cerro Rico also evolved as its global fame grew. The indigenous polemicist and artist Felipe Guaman Poma de Ayala is best known for his *c.*1615 denunciation of Spanish

III.

Wie die Indianer das Goldt auß den Bergen graben.

DIe Indianer arbeiten auß dem Gebirge Potoſſi welchs wol für daß reich-
ſte Gebirg in gantz Indien mag gehalten werden/ daß Goldt herauß ſolcher geſtalt/ wie man
hie zu Land/ in den Bergwercken auch thut/ nemlich ſie müſſen es alle auß den Felſen herauß
hawen / vnnd theilen die Arbeiter in zwey Theil / ein Theil arbeitet deß Tags vnd ruhet deß
Nachts/ der ander Theil ruhet deß Tags vnd arbeitet deß Nachts / wiewol ſie eben ſo wenig
Tag eine Zeit als die ander ſehen / ſondern müſſen ſich ſtets mit Kertzen behelffen/ dann ſie
wol 150. Klafftern tieff vnter der Erden ſtecken / doch müſſen ſie vnangeſehen der groſſen Höhe / alle das Ertz
auff jhren Rücken hinauff tragen. Darzu ſie dann Leyter gebrauchen / die gedoppelt nemlich zwo an einander
gemacht ſeyn/ dieſe Leytern ſind von gewundten Ochſenhäuten gemacht/ vnnd mit höltzern Staffeln durch zo-
gen/ gehen alſo allzeit drey hinter einander hinauff/ vnd darneben drey auff der andern Seyten hinab/ vnnd weil
ſie ſich allezeit mit beyden Händen halten müſſen / im hinauffgehen/ hat der förderſt allezeit ein brennende
Liecht am Daumen gebunden / weil auch wie gemelt / der Weg hoch hinauffzuſteigen
iſt/ haben ſie vnterwegens Ruhebäncke/ darauff ſie mit jhrer
Laſt ruhen können.

Von

Figure 10. Theodor de Bry, Historiae Americae VI *(1601; courtesy of John Carter Brown Library at Brown University).*

Figure 11. Matteo Ricci and Li Zhizao, world map, c.*1602 (courtesy of the James Ford Bell Library, University of Minnesota, USA).*

Figure 12. Felipe Guaman Poma de Ayala, Plus Ultra, the Inca: *'I am the support for your columns',* c.*1590 (Guaman Poma de Ayala in Martín de Murúa,* Historia del origen y geneología real de los reyes Incas del Perú c. *1590 (Galvin ms.); courtesy of Seán Galvin, Image Getty Research Institute).*

misrule in the Andes.[1] The *Primer nueva corónica* is a lengthy indictment of corruption and greed, much of it fuelled by Potosí silver. On page after illustrated page, the writer begged King Philip III for reform. Yet Guaman Poma was also proud of the Cerro Rico, which he linked to the Incas. In an earlier image from about 1590, Guaman Poma illustrated the Cerro Rico as a symbol of two intertwined empires (Figure 12). He paints an Inca standing behind the mountain holding the symbols of the Spanish Habsburgs, Charles V's Pillars of Hercules and the motto *Plus Ultra* ('Farther Beyond', i.e., beyond the Straits of Gibraltar to the Indies). Guaman Poma insists that the Spanish Empire relies entirely on this sacred Inca treasure by asserting that the Cerro Rico is 'the support for your columns'. Not one to give up on powerful symbols, Guaman Poma included a modified version of this image in his 1615 'letter'.

[1] F. Guaman Poma de Ayala, *El primer nueva corónica y buen gobierno* (1615).

Figure 13. Arnoldus Montanus, Cerro Rico of Potosí (c.*1671; courtesy of John Carter Brown Library at Brown University).*

Potosí's Cerro Rico fell into decline in the 17th century, but it was still one of the world's top silver producers. It remained the envy of the globe. A French Basque known as Accarette du Biscay visited Potosí in 1657 and described it in loving detail for Louis XIV's minister Colbert. There was even a plan to invade via Buenos Aires, but war with Spain ended in 1659. The Dutch and English picked up on Accarette's description and engraver Arnoldus Montanus rendered the Cerro Rico in another indelible image published in 1671 (Figure 13). The same image was republished in London in Ogilby's *America*.[2] Here the Imperial Villa appears lush, as if located in Brazil. A thinly clad African man sporting an indigenous headdress walks barefoot behind an ox-drawn cart, a sight never seen in a rugged, high-altitude city of mules and llamas. The engraver's misunderstanding of the use of wind furnaces and mills led him to assume that Potosí's refiners crushed silver ore with windmills. A whole field of them populates the background. Such were the Dutch dreams of Potosí.

When English investors floated the idea of the South Sea Company in 1711, Montanus's engraving of the Cerro Rico was repurposed for promotional posters, including Herman Moll's popular 1712 map (Figure 14). The South Sea Company went famously bankrupt in 1720 when the bubble burst, but the

[2] J. Ogilby, *America* (London, 1671).

Figure 14. Herman Moll, map of South America and Cerro Rico of Potosí (1712; courtesy of the US Library of Congress).

dream of conquering the Cerro Rico died hard. The English would return almost a century later to try out new technologies. Meanwhile, notary books in Potosí recorded the arrival of enslaved Africans sent by the South Sea Company from what are today Nigeria and the Democratic Republic of Congo to Buenos Aires.

In Potosí itself, the Cerro Rico came to be regarded as a sacred baroque symbol of empire, rendered in several paintings as the encompassing body and robes of the Virgin Mary (Figure 15). Such images reinforced the mine owners' sense that religious piety would be rewarded with a bounty of silver. Elites set aside fortunes to build the Imperial Villa's impressive churches, convents and monasteries, which expanded when the mines produced the least.

The second viceroy to visit Potosí was also the archbishop of nearby Charcas, Don Diego Morcillo Rubio de Auñón. Local painter Melchor Pérez Holguín memorialised the event with a huge 1716 canvas that now hangs in Madrid's Museo de América (Figure 16). This gift to Philip V of Bourbon was matched in a more sacred vein by the archbishop-viceroy Morcillo, who commissioned a massive silver pedestal in the shape of the Cerro Rico, which he sent home to Spain. It now supports a statue of the Virgin of Charity in Villarrobledo, a small town in the province of Albacete, La Mancha (Figure 17).

With the Bourbon reforms of the 18th century, which included the halving of the severance tax from a fifth to a tenth (1736), creation of a savings bank (1747) and mit'a reform (*c.*1750), the Cerro Rico began a long but slow recovery. A new mint opened in 1773, outfitted with state-of-the-art equipment, and advice on mining and refining was sought all over Northern Europe. Rationalisation of mining and refining entailed a new, less organic vision of the Cerro Rico, as revealed in a 1772 diagram purporting to 'square the circles' and get to the bottom of the mountain (Figure 18).

Figure 15. The Virgin of the Cerro Rico of Potosí (c.1680; courtesy of Casa Nacional de la Moneda, Potosí; photo by K. Lane).

The Bourbon reforms paid off, although at great human cost. Production soared into the 1790s as mit'a workers laboured much harder than in the past, their ore quotas set higher and higher, and the rate of mercury consumption in the refineries fouled more water and air than at any time since the late 16th century. New technologies and more punishing work regimes could not solve all problems, however, and as the Cerro Rico's mines grew deeper, they grew ever more expensive to work, more prone to flooding, cave-ins and simply playing out. The great Andean insurrection of the early 1780s spared the Imperial Villa of Potosí, but it severely disrupted the mit'a and ordinary supply chains.

By 1800, the city was in crisis again, facing drought on top of everything else. Mining continued in spurts, but by the time independence stirrings began in 1809, the Cerro Rico was nearly moribund. Rebels invaded from Buenos Aires in 1814, only to be driven out by royalists soon after, both groups sacking and pillaging the city, mint and rural estates. When Simón Bolívar finally reached Potosí in 1825, the city breathed a sigh of relief. The Liberator climbed to the top of the Cerro Rico to declare his work finished. South America was free.

Figure 16. Melchor Pérez Holguín, Entry of the Archbishop-Viceroy Morcillo, 1716 (courtesy of the Museo de América, Madrid, Spain).

Figure 17. The Virgin of Charity on a silver pedestal fashioned in Potosí or La Plata, dated 1719 (courtesy of Santuario de la Virgen de la Caridad, Villarrobledo, Albacete, Spain).

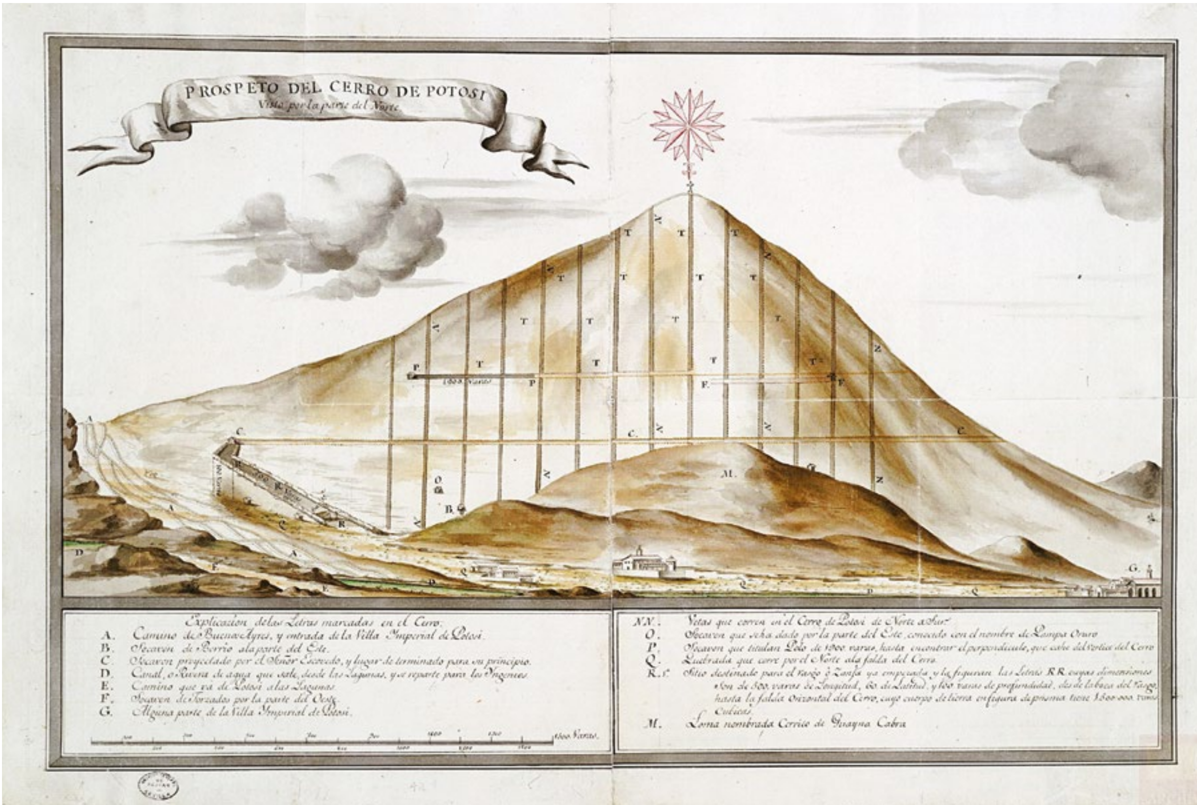

Figure 18. The Cerro Rico of Potosí, 1772, with modern Berrío adit at left (courtesy of the Archivo General de Indias, Spain).

Figure 19. Medal commemorating Simón Bolívar's arrival in Potosí, 1825 (courtesy of Daniel Frank Sedwick LLC, auction #23, lot 1479).

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PIECE OF EIGHT

Alejandra Irigoin and Bridget Millmore

Figure 1. Piece of eight with Plus Ultra *pillars, Potosí mint, 1663 (courtesy of the Trustees of the British Museum).*

The 'Spanish' or 'Spanish American' *peso* or 'piece of eight' was the first global currency, and its impact was deep, long lasting and far reaching. Successively known in Spanish first as *ryal* or *real*; in English as piece of eight, cob or pillar; in French as *piastre*; and after 1730 in Spanish as *peso columnario* or *moneda columnaria* and milled dollar in English, this specie was also well known in Asia. After 1772 the specie stamped with the face of the king was also called the Carolus or bust dollar. These coins circulated the world from South America to Asia via European and Mediterranean ports and cities and travelled directly through the Pacific, affecting the economies of countries producing, intermediating and demanding it. The piece of eight also shaped the endeavours of traders, the innovations of manufacturers and the conditions of workers well beyond the mines. As they circulated far and wide across the oceans, these coins changed people's consumption habits by providing access to a wealth of imported goods. Pieces of eight were traded for luxury items including spices, silk and cotton textiles, porcelain and tea, all of which became staple commodities as global commerce expanded.

Early modern states and empires did not always have the precious metals required to produce their own coins. The abundant pieces of eight provided a source of reliable currency where cash was scarce and banks did not yet exist. In addition to commercial trading, pieces of eight were used in a variety of contexts: stored as reserves in the Netherlands, Britain and America; received for taxes in China; paid to seafarers in the Mediterranean and the Pacific Oceans alike; sent home by Chinese migrants in East Asia; used by European governments to recruit foreign mercenaries; mobilised through charitable donations across the Spanish Empire; and offered to ancestors in indigenous ceremonies in Peru. The ubiquity of the piece of eight stemmed from the sheer number minted and the steady quality of its coinage. As a result, it circulated worldwide at a value above its content of fine silver.

Pieces of eight, large silver coins famed for their appearance in pirate stories and films, started life deep within mines far from the sites of such storied maritime adventures. The coins were fashioned from more than 70,000 tonnes of silver mined in the Hispanic

Indies or America from the 16th to the 19th centuries, most notably from the silver 'Rich Mountain' of Potosí in the Viceroyalty of Peru and Zacatecas in New Spain or Mexico. At its most prolific in the 17th century, Potosí produced 60 per cent of the world's silver; a century later, Mexico alone produced 70 per cent of the world total. The mining of silver on such a vast scale in the New World brought extraordinary wealth and global reach to the Hispanic monarchy. Thanks to the availability of resources essential for silver refining – like mercury, salted water to wash it out and wood fuel for smelting – refining could take place on site, and as a result the environmental and human cost of silver mining was devastating.

The journey from silver ore to manufactured coin was long and complex. It involved the coerced, rotational (*mitayo*) and free labour of hundreds of thousands of workers (mostly Indians but also *mestizos* and African slaves) in the New World. Since mining was the engine of the broader economy, many more people worked in agriculture and textile production to clothe and feed the mine workers and ore carriers who transported the bulk product to refining centres and mints in three of the biggest cities of the Hispanic Indies or America. The precious metal left the region mostly as newly minted coins stowed in linen bags and mainly as return from private trade, not as a royal exaction.

Until the late 18th century the silver dollars or pesos were minted in three cities only: Mexico, Lima and Potosí. The process involved cutting the silver with pliers into discs or planchets of a specified weight and purity, set at a weight of 423.9 grains, or 27.47 grams inclusive of alloy, and 930.7 thousandths of fine silver quality. The blanks were then struck with a hammer between two dies and imprinted with two different designs, one for the obverse face and the other for the reverse. The resulting hammered coins became known as cobs. Cob designs changed little over the period they were minted, between 1536 and 1732, but always featured a number of distinctive details which provided information on the specie. These details included the initials of the assayer and of the mint house where the coin had been made, the denomination (number of *reals*) of the coin and the name of the current king. Dates were added in the early 1600s. The coins were decorated with symbols of power of the sovereign; for example, on the obverse they displayed the Habsburg standard

Figure 2. Silver cob or piece of eight; Potosí mint before 1617 (courtesy of University of Notre Dame Department of Special Collections).

and the Jerusalem cross between the lions and castles of the Castilian coat of arms (Figure 1). The legend *Hispaniarum et Indiarum Rex* evoked the *plus ultra* reach of the monarchy and distinguished the cob from coins minted in Spain that made no reference to the Indies. As they were hand struck, it was difficult to keep the uniformity and the integrity of the coin, making it easy for people to profit by clipping or shaving the silver from their edges (Figure 2). Mexico alone cut 761 million of these coins.

Minting in Spanish America was very much a private business. Mint offices were purchased by wealthy merchants who in turn bought the ore from miners at a discount. After a massive adulteration of the coin in 1640s Potosí, most features about the minting remained the same but the appearance of the coin changed. The new reverse side portrayed the Pillars of Hercules and swirling waves, representing the overseas extension of the monarchy or empire, with the words *Plus Ultra* between the columns. Thereafter these coins became known as *moneda columnaria*. The impact of the Potosí debasement loomed large in Europe and Asia and prompted the introduction of new coinage technology. This impact, together with other reforms, meant that the production, minting and export of silver would leap to new heights.

Beginning in 1732 in Mexico, the introduction of mule-driven rolling mills produced blanks of very consistent thickness, since both the mechanical cut of the disc and the details of the coins were now embossed by a screw press. Furthermore, a set of rings were used to imprint a corded edge on the coin designed to prevent clipping, known as *de cordoncillo* (Figure 3). Thus, milling and the new minting process resulted in a coin that was uniform in purity,

Figure 3. Silver pillar dollar or piece of eight, Mexico, 1770. Public domain.

size, weight and dimensions. The coin had a 38 mm diameter, weighed 417.6 grains or 27.5 grams with alloy and at 916.6 thousands of fine contained 25.6 grams of silver. A centralised engraving of the dies – sent from Madrid – standardised the aspect of the coins throughout.

The crowned pillars, indicating the unlimited reach of the Hispanic monarchy, are accompanied by the motto *Plus Ultra*, meaning 'beyond' (the Mediterranean). Between the pillars are two orbs or globes, representing the New and Old Worlds with the waves of the oceans swirling below, together with the mint mark and year of coinage. The words *UTRAQUE UNUM* on either side of the pillars allude to the East and West Indies, or to Hispania and the Indies. As with the pieces of eight, the reverse shows the Castilian arms with the coin's denomination, the assayer's initials and the king's name as sovereign in the Hispanic monarchy by grace of God, all of which remained the same. With such detail, the history of where, when, how and by whom a coin was minted is not so difficult to trace.

Total coinage in Spanish America doubled by 1750, and by the 1780s the volume that had been minted in the 1730s had nearly tripled. Successively the other mints in America adopted this technology – Lima in 1750 and Potosí in 1771. Other mints opened in Guatemala in 1733, in Popayán and Bogotá in 1758 and in Santiago de Chile in 1772. In all these, the peso coin, equivalent to eight reales, was overwhelmingly the denomination most often minted. This was a large value for current money in domestic and retail markets, creating problems of scarcity of small change in the local Spanish American economies. In 40 years, the Mexico mint coined 462 million pieces of this type.

In 1772 the arms of León and Castile were replaced by the bust and the name of the current king and emperor and the year. On the reverse, the Castilian standard was inserted into the space between the pillars in lieu of the two globes, together with all the details of the minting. This coin maintained the size and total weight but had a lower content of fine; at 902.7 thousandths, the pure silver was 24.7 grams, so the peso was slightly debased. The minting of Spanish pesos and dollars reached its peak, producing 24 million pieces a year, by the 1790s. Exports to Europe and China peaked at the same time. These coins with the face of Charles III or Charles IV were widely known as bust or head dollars and in Asia as the Carolus, old or Buddha heads, long robes or *sikong-yin* in China, and also *sangong* (three gongs) and *singong* (four gongs) in reference to the roman numerals III and IIII that followed 'Carolus' (Figure 4).

This specie was the forerunner of the American silver dollar designed by Alexander Hamilton in 1791, which nearly replicated the dimension, purity and weight of the coin to identical specification. The Chinese quickly recognised the distinction between the Carolus and the Fernand heads, which they called the short robe, and started receiving the coins at a discount (Figure 4). The Carolus peso remained in high demand inside China well into the 19th century, but the end of its coinage after 1808 led to an end of Chinese imports of silver. After independence, the coordinated, empire-wide production of silver coinage ceased within ten years, with each republic

Figure 4. The obverse of a 1797 coin showing the bust of Charles IV (left); the obverse of a 1810 coin with the bust of Ferdinand VII, possibly from Mexico (right) (courtesy of the personal collection of the author).

minting their own silver specie. It was the end of the monetary standard that the Spanish American silver coin had provided to the early modern world.

The social lives of three coins may serve to illustrate their extraordinary global impact. Our first example is a coin that carries the merchant marks of Chinese silver assessors. The second has been countermarked with the name of a British cotton mill. The third coin is no longer a coin. It has been crafted into a love token and re-engraved with words of affection and belonging. These three mini-histories offer glimpses into how a small object held in the hand and carried in a pocket or purse affected people's lives in memorable ways. Each illustrates how money is so much more than a token means of payment – how it can become embedded in not only economic but also social and emotional values.

Our first coin is a piece of eight stamped with what are known as chop marks. From the early 1600s China imported more silver than any other good or commodity, lacking institutions to mint her own. Spanish American coins offered China a valuable import that could support the overseas sale of Chinese manufactures, such porcelain, silk and other Asian textiles that Europeans re-exported worldwide. Chinese assayers or shroffs tested the quality of the imported coins and stamped them with their own marks each time they were exchanged (Figure 5). In so doing, they certified the purity before accepting a coin in payment. The chop marks took the form of Chinese characters as well as symbols, and guides were published to identify different marks. In other words, these marks indicated that the coins were acceptable for trade and current within China. The piece of eight played a substantive role in the development of Eurasian trade while supplying China with a much-needed source of reliable, convenient and abundant means of payment. It facilitated the trading of goods within China, where local silver and coins were lacking.

Figure 5. Charles III silver dollar minted in Santiago de Chile (1784), stamped with Chinese merchant marks (courtesy of the personal collection of the author).

Our second example illustrates how the coin which was adapted to meet the cash needs of industrialising Britain. With practically no English coinage of silver for most of the 18th century, at a time of rapid mechanisation in the production of cotton textiles and in the context of inflation caused by the French wars in Europe, the northern cotton towns suffered from a severe shortage of means with which to pay their mill workers. The fast-growing production of cotton in the country relied heavily on a large workforce. Without sufficient coins of a convenient denomination, manufacturers faced problems retaining good workers. Rather than using large-denomination gold coins, bank notes – the Bank of England notes were worth £50 until 1797 – or low-denomination copper coins of dubious origin, mill owners took the step of countermarking the Spanish American silver dollars that were available in abundant supply. It proved successful, and during the restriction on conversion of bank sterling notes into gold after 1797, the Bank of England also resorted to countermarking some of their reserves of Spanish American pieces of eight – and even bought large quantities of them – to alleviate the domestic shortage of cash at home, to pay foreign allies and to ensure the East India Company remained able to trade in Asia.

Mill owners and manufacturers in the northern industrial centres imported coins and marked them with their own stamps, altering the face value of the coin to a higher value than its intrinsic silver content as a way of ensuring the money was accepted and stayed in circulation. The illustrated example is inscribed with the name of Cromford Mill as well as the value of four shillings and ninepence – whereas the mint price was four shillings and sixpence (Figure 6). The coins were exchangeable by the mill workers in the factory shops and sometimes in the local towns. The practice of countermarking increased with prices and wages and is visible in the subsequent stamping of Spanish American coins with values of five shillings and even five shillings and sixpence (Figure 7), shadowing changes by the bank countermarks. This provided a vital solution to a serious problem for the industry, and the countermarked coins are material evidence of a time of great change in the lives and purchasing power of British workers.

Figure 7. Charles III piece of eight from 1782, minted in Mexico and countermarked with the stamp of Ballindalloch Cotton Works in Scotland (courtesy of the Trustees of the British Museum).

The practice of turning low-value coins into mementoes for family and friends was particularly popular during the 18th century among the poorer sorts in Britain. While the ruling elite and middling sorts offered loved ones gifts of luxury objects or commissioned elegant portraits, the lower ranks resorted to using the materials they had to hand. Domestic items ornamented with personalised inscriptions and affectionate symbols were often given to commemorate important life events.

Similarly, silver and copper coins were rubbed smooth and re-engraved with names and idioms of love and offered to mark births, marriages and deaths. With so many silver pieces of eight in circulation, it is not surprising that examples of love tokens crafted from these coins survive. The reverse side of the coin (Figure 8) is unchanged, revealing it was minted in Mexico during the reign of Ferdinand VI (1746–59). The obverse side, however, has been rubbed smooth, and the new inscription shows the winged figure of Cupid carrying a bow and pointing at an altar of love on top of which sits a flaming heart – all familiar imagery symbolic of love and affection. The accompanying idiom reads 'When this you see/Pray think on me/ Thomas Harding'. Although Thomas's story and why he is named on this token remain unknown, the words and picture speak of love and remembrance. The desire to be remembered is frequently found on love tokens, suggesting they were used as parting gifts at moments of separation. Indeed, these emotionally charged objects became important in the customary practices of British families and communities.

The piece of eight made the world go round in more ways than one. Spanish American dollars were minted as a means of exchange within and beyond the vast *plus ultra* realm of Hispanic monarchy and the empire of the Indies. Produced in huge volume and with remarkable consistency, the coins quickly flowed around the world, supplanting poor coinage and filling the need for cash far beyond the site of production in Peru and New Spain or Mexico. The three cases briefly examined here suggest that the coins not only moved goods but shaped networks of people and things, affecting the private lives of individuals across the globe.

Figure 6. Charles III piece of eight from 1801, minted in Mexico and countermarked with the stamp of Cromford Mills in Derbyshire (courtesy of the Trustees of the British Museum).

Figure 8. Ferdinand VI piece of eight, minted in Mexico (possibly), altered into a love token (courtesy of the Trustees of the British Museum).

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PIEZA DE INDIAS

Pablo F. Gómez

Traditional scholarship in the history of science associates the quantifiable, universal human body with the European Enlightenment or 'new science'. This measurable, universal body, it is argued, came to define modern medicine. Behind it lay the driving forces of political economy, statistics, life insurance and modern industrial capitalism. But this widely accepted history of the universalisation and systematisation of human corporeality ignores an earlier global history of enslaving and measuring bodies in the Indies, born of the Iberian slave trade between Africa and colonial Iberian America. It was in the violent and profitable world of this slave trade that universal concepts and calculations of health risks, disease and bodily characteristics first emerged. Indeed, the scale of data production about bodies in the early modern world of Iberian slave trading far outpaced all contemporary systems of production of knowledge about the human body. The key concept in this early modern quantification of the body was the *pieza de Indias* (Spanish) or *peça da India* (Portuguese).

Sixteenth- and 17th-century slave traders in the Iberian world imagined slave bodies and the diseases that affected them to be measurable and comparable on the basis of normalised or idealised, constant standards. The appearance of this new measure and epistemology was intimately linked to the unprecedented rise in the size and complexity of the transatlantic commerce in human bodies during the first decades of the 17th century. The new, universal measure of man was the result of the slave trade's need to quantify the risks of investing in human corporeality and its modern afflictions. By the late 16th century, Iberian slave traders, governments, corporations and financiers from around Europe (particularly from Genoa, Florence and the Netherlands) were already thinking of the transportation of slave bodies as units of risk. The original licences for slaves transacted in Iberia were contractual concepts that did not refer to bodily characteristics. The licences were of limited help to slave-trading communities for calculating the productivity of capital. Consequently, slave traders and slave-trading organisations, including the House of Trade (Casa de Contratación) in Seville, developed methodologies that allowed them to translate slave bodies into numbers and calculate the inherent value of corporeality as it related to an increasingly normalised, constant unit called the *pieza.* The concept of the pieza (the piece) allowed for the creation of contracts where investors, providers and the state could prospectively calculate tariff, gains and risk using quantifiable notions of bodies that had not yet been purchased or evaluated.

The historical record makes clear that the concept of 'the piece of the Indies' itself was already firmly established across the Atlantic basin by the early 1600s. The literature on the subject associates the origins of the term *peça/pieza* to pieces of fabric exchanged for slaves in 15th- and early 16th-century Portuguese trading posts in West Africa, where traders exchanged adult male slaves for imported fabrics. Market forces in West and western Central Africa pressured Iberian traders to conceptualise slaves in a way that would allow the traders to define the specific characteristics of the bodies they were buying and selling. In addition to peça, Portuguese slave traders used several other terms to refer to slaves who were not adult males, reflecting an increasingly rich taxonomy that revealed traders' rising ability to evaluate corporeality and maximise profits. Of relevance here were those terms related to children or youth. *Muleque* or *muleca*, for example, one of the terms slave traders used for children less than 12 years old, comes from the Kimbundu word *muleke*, which refers to a dependent. *Cañengues* classified children two to four years old, and the term comes from a word that means 'child' in Angola. Slave traders began using these terms to refer to young bodies that they discounted at rates of two or three to one, relative to adult male slave bodies. Calculating the value of *cañengues*, *muleques* and *mulecas* by converting them into standard adult male piezas was a common practice by the beginning of the 17th century. Portuguese officials in Sao Paulo da Assumpcao de Loanda deployed the concept when they tallied 'the dispatch', or fees due to the Portuguese crown, for the embarkment of African slaves bound for the Americas. Such methods to appraise slave bodies became normative in Spanish America for determining the tariffs that traders had to pay to introduce slaves in the New World. By the late 1530s, crown officials were counting the 'pieces of slaves' *(piezas de esclavos)* disembarking in Santo Domingo and selling them to miners, Jesuits, hacienda owners and even other Blacks to work in the mines and estates of the island. By the end of the 16th century, a concept of an ideal body for transportation and labour – as an object of trade – had emerged across the Atlantic, and during the first decades of the 17th century it was disseminated across the Pacific and Indian Oceans, being widely used in Dutch trading records.

In addition, slave traders and governmental officials used the term *pieza* to talk about other captive bodies from the Indies, most notably native or 'Indian' bodies in the Caribbean.

The concept of the piece of the Indies appears in full form in the 1660s as part of negotiations of the terms of the *asiento de negros* or slave monopoly between the Spanish crown and the Genoese financiers Domingo Grillo and Ambrosio Lomelín. The contract with the Grillos established that they would 'bring 24,500 blacks, piezas de Indias, over the course of seven years and starting in 1662'. The monopoly established as one of its conditions that 'the said quantity of blacks should be piezas de Indias, each one seven *cuartas* of height and up'. The measure of height was not arbitrary. Slave traders used height as a proxy for life histories of health and nutrition and as a predictor of the slave's potential productivity in terms of physical labour. Height was also the most readily standardised aspect of bodily quantification for contracts that depended on appraisals made by a diverse array of evaluators around the Atlantic. Slave-trading communities created a complex system around the marker of height that accounted for diseases, gender and age. The catalogue of distinctions and markers is extensive, and space here precludes treatment of all categories. A few examples are illustrative of the efforts that slave traders made to standardise corporeality. Being female or having grey hair, for instance, translated into a reduction in value of one *cuarta* or one-seventh of the standard pieza. The conditions of 'cloud in one eye [cataracts]' signified a reduction of two cuartas; scurvy, two cuartas; phlegm, one and one-half cuartas; a 'benign hernia', one cuarta; a 'broken navel', two and one-fourth cuartas; being one-eyed, two cuartas; and having a lazy eye, one cuarta. Being older than 35 years merited a one-cuarta deduction from the standard of seven. Having signs of *tinea capitis* (scalp ringworm) meant a reduction of two and one-half cuartas; having a hernia (of the worst variety called *carnosa*), one and one-half cuartas. The presence of *lobanillos* (small tumours) was worth one and one-half cuartas' reduction; small fingers, one-half cuarta; incapacitating scars (burns), one and one-half cuarta; loss of a toe, one-sixth of a cuarta; localised ulcers, one-sixth of a cuarta; generalised ulcers, one cuarta; scurvy, two cuartas; 'humours' or lesions in the hands, one-sixth cuarta; 'humours' in the feet, one-eighth cuarta; other 'spots', not of scurvy, three cuartas; broken hands, three cuartas; a broken finger, one-half cuarta; a broken toe, one-third cuarta; extreme old age, one cuarta; dropsy, one and one-half cuartas; *apostema* (a tumour or abscess), one cuarta; blindness, three cuartas; abnormal fingers, one cuarta; different sizes of eyes, one-eight cuarta; dysentery, two and one-third cuartas; '*bicho*' disease, three cuartas; fistula in the scrotum, one and

Figure 1. M. Chambon, Le commerce de l'Amerique par Marseille *(Avignon,1764), vol. 2, plate 11, facing 400 (in* Slavery Images: A Visual Record of the African Slave Trade and Slave Life in the Early African Diaspora; *licensed under CC BY-NC 4.0; courtesy of John Carter Brown Library at Brown University).*

one-half cuartas; wounds with exposed bone, three and one-half cuartas; short-sightedness, two cuartas; missing arms, three cuartas; missing legs, three cuartas; missing molars, one cuarta; broken bones in the arms or hand, two cuartas.

The contractual articulation of the concept of the piece of the Indies, and the recording of the method used for its calculation, formalised slave-based knowledge production about human bodies. The contract assembled a vast storehouse of knowledge, much of it held in the House of Trade in Seville, obtained from thousands of records of bodily characteristics and diseases for hundreds of thousands of bodies that traders in Africa, the Americas and Europe had quantified and tabulated. The Grillos' contract set a precedent for the 1679 contract between Spanish and Portuguese merchants and the Dutch West India Company. The 1696 *asiento* between Spanish crown and Francisco Marín and Nicolás Porcio, for example, agreed they would transport 10,000 tonnes of freight including 30,000 piezas de Indias of the 'regular measure of seven cuartas'. Similarly, a 1709 contract between the French Compagnie de Guinée and Dutch slave traders, settled in Amsterdam, specified that the French would pay 110 *pièces de huit* (pieces of eight) 'for each black piece of Indies' delivered in the Caribbean. As the 'new science' of the European Enlightenment dawned in Europe, the piece of the Indies was well established as the most disseminated universal measure of the human body.

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RUBBER

Heloisa Maria Bertol Domingues and Emilie Carreón

Rubber began its bouncing global career in the late 15th century. Among the wonders that Christopher Columbus returned with from his second voyage to the Indies or, as it would later become known, the New World (1493–6) was a ball of remarkable characteristics apparently obtained in the Antilles. Bartolomé de las Casas wrote, 'I saw one, as big as a small jug, which the old admiral brought to Seville', noting that the rubber ball bounced 'six times more' than the inflated balls he knew.[1] Spanish naturalist Gonzalo Fernández de Oviedo y Valdés asserted that 'these balls bounce much more than those filled with air. They are without comparison, because when dropped on the ground, they spring up, and bounce again, again and again, [gradually] slowing their bounce.'[2] Peter Martyr, chronicler to the Council of the Indies, wondered: 'How is it that with only a touch they reach the stars with an incredible jump?'[3] The Aztec emperor Moctezuma had introduced Hernán Cortés to the rubber ball game, and on his return to the Iberian Peninsula the conqueror presented Tlaxcalan ball players before the court in Barcelona, where Christoph Weiditz depicted two of them lobbing the ball, striking it with their hips (Figure 1).

The early fascination of the Old World with the Mesoamerican rubber ball was less concerned with the botanical species from which elastic rubber is made than with the ingenious products and uses that could be made of it. The balls, made by winding strips of rubber around a perishable core or by compressing coats of rubber by various means, were thus compared to the *follis*, a leather ball containing an inflated bladder; to the *trigonal,* a small ball stuffed with hair; to the *paganina*, which was filled with feathers; and to the *harpasso*, as described by Marcus Valerius Martialis (*c.* AD 41–*c.* 104) followed by Sebastián de Covarrubias y Orozco (1539–1613). It is clear, however, that in Mesoamerica the rubber ball and its game was much more than a sport. In the *Popol Vuh*, a sacred Maya text recounting the mythology of the Quiché people of the Guatemalan highlands, the story of creation begins with Hun-Hunahpú and Vucub-Hanahpú playing ball. The

1 B. de las Casas, *Apologética historia sumaria cuanto a las cualidades, disposición, descripción, cielo y suelo destas tierras, y condiciones naturales, policías, repúblicas, manera de vivir e costumbres de las gentes destas Indias Occidentales y Meridionales cuyo imperio soberano pertenece a los reyes de Castilla* (Mexico: Universidad Nacional Autónoma de México, Instituto de Investigaciones Históricas, 1967), vol. 1, 322.

2 G.F. de Oviedo, *Historia general y natural de las Indias, islas y Tierra firme del Mar Océano,* libro 6, cap. 2 (Mexico: Centro de Estudios para la Historia de México, Condumex, 1979), folio LIX.

3 P.M. de Anglería, *Décadas del Nuevo Mundo* (Mexico: Porrúa, 1964), vol. 2, 537–49.

hollow sound of the bouncing ball striking the court bothered the lords of Xibalba, the underworld, who had summoned the twins to play only to trick them and take their ball and equipment away.

The Mesoamerican rubber ball game, today called ulama, was widespread; more than a thousand ball courts have been identified by archaeologists. The Aztecs or Nahua of central Mexico performed a highly prized version of the game. The *Codex Mendoza* registers 16,000 rubber balls as annual tribute to the Templo Mayor in Tenochtitlan, where caches of balls have been found in the House of the Eagle Warriors. Excavations carried out in El Manatí, southern Veracruz, uncovered Olmec rubber balls associated to ceremonial axes and carved wood figures, and the tunnel beneath the Pyramid of Quetzalcoatl in Teotihuacán also revealed rubber balls, in sacred caches with *strombus* shells. Throughout time versions of the game were practiced across Mexico, in the north, south (Monte Albán and Dainzú), east (El Tajín) and west (Teuchitlán), as well as in the Maya region to the southeast and in Belize and Guatemala. At Tikal the remains of a rubber ball were discovered associated with ball game paraphernalia, and in Calakmul rubber was unearthed in a funerary context. Much rubber was also dredged from the cenote of Chichén Itza, found in the shape of balls used for incense and modelled as anthropomorphic figurines, similar to those still made by the Lacandon of Chiapas.

Notably, in early modern accounts of the Mesoamerican game, the rubber ball appears to be the personal property of the player. Mexican players brought to Spain and Italy carried their equipment and balls with them, some of which were collected as objects of interest once the game was over. Early accounts described the rubber ball as measuring the size of a human head and weighing around six pounds. In the wake of conquest and evangelisation, most ball courts were destroyed, being linked to demonic practices, possibly among warriors. The ball game was forbidden, ostensibly to protect players from injury. Thus, only the first generation of conquerors and missionaries saw the masonry ball courts in action. Nevertheless, balls were kept secretly by some. For example, Martín Ocelotl was condemned for practicing idolatry and his possessions, including two rubber balls, confiscated by church authorities and possibly burnt for being works of the devil. Still, the rubber ball game clearly persisted in some places. A film by Roberto Rochín entitled *Ulama: el juego de la vida y la muerte* revealed the game's survival in modern Sinaloa.[4] Today, the game is having a boom, flourishing in communities of hip-ulama ball players seeking the preservation of an ancestral game and part of a burgeoning tourist industry that performs pre-Columbian Mexico as experiences. Nonetheless, rubber was bound for greater things.

In addition to the balls, regular friars repeatedly mentioned other uses of the milky sap that was collected by cutting the bark of the tree. Latex, they noted, was used to make *olmaitl*, rubber-tipped batons for striking horizontal wooden slit drums called *teponaztli*; *olcactli*, rubber-soled shoes; as well as a manner of breastplate that deflected arrows. Latex rubber was also shaped into anthropomorphic sculptures called *ulteteo* and into irregular rounded forms set afire as sacred offerings in ceremonies. Among the ancient Mexicans, burnt and melted rubber served in rituals as an aromatic substance mixed with copal. It was made into a black ritual paint as well, and as an ointment it was a remedy for skin, eye and stomach ailments.

Although botanical information and harvesting practices were recorded in the 16th century, systematic scientific interest in the sources of rubber notably expanded in the 18th century. In New Spain, the history of the first royal botanical garden (1791) is closely linked to the history of the rubber tree, called *olquahuitl* in Nahuatl. Following Linnaean classification systems, in the garden's inaugural ceremonies the rubber tree of southern Mexico and Central America was named *Castilla elastica, Cerv*.

In South America, the Franco-Hispanic expedition to measure the equator, led by Charles Marie de La Condamine, reported that the Omágua tribe near the city of Manaus in the Brazilian Amazon possessed good knowledge of rubber trees and latex. Amazonian samples, stored in rolls, were sent to the Academy of Sciences in Paris, together with information about the uses of the plants from which the dark, resinous material was extracted. Amazonian people used it to make very resistant bottles and containers, boots,

[4] R.R. Naya, *Ulama: el juego de la vida y la muerte* (documentary film, 1986).

Figure 1. Christoph Weiditz, Authentic Everyday Dress of the Renaissance *(New York: Dover, 1994) in* Trachtenbuch, Nachdruck der Ausgabe *(Berlin, 1927).*

and hollow balls that collapsed when kneaded then returned to their original shape. The samples were accompanied by a text entitled *Extrait historique de la suite des opérations des académiciens pendant les dix années qu'a duré le voyage de l'Équateur*,[5] in which La Condamine explained that the material was known in Quito, whence he had shipped it, by the name of *caoutchouc* or *cahuchuc*. In his report presented to the Academy of Sciences in 1745, he stressed that the everyday uses of the plant were extraordinary. When cahuchuc was recently collected and the resin still fresh, he noted, it could be moulded however one wished.

After La Condamine published his findings in Paris, botanists focused on the taxonomic classification of the rubber tree. In France, Jean Baptiste Christophe Fusée Aublet published an accurate description of a tree producing rubber, native to Guyana, and named it *Hevea guianensis* without realising its relationship to the sample sent earlier by La Condamine. In the same year, Jean-Baptiste Lamarck analysed a dry species suspected to be different than that classified by Aublet. In 1807, the Austrian botanist Franz Sieber, passing through Belém, in the state of Pará, Brazil, obtained a specimen with flowers and sent it to the director of the Berlin Botanical Garden, Carl Ludwig Willdenow. In Germany the species already known as the rubber tree was given a scientific name by Willdenow in 1811: *Hevea brasiliensis.* In 1865, Johann Müller von Aargau published a taxonomic analysis of the specimen sent by Sieber in the journal *Linnaea,* confirming the name *Hevea brasiliensis* and establishing this as the highest yielding species of rubber latex.[6] The rubber tree finally won a prominent place in the herbarium of the botanic gardens in Rio de Janeiro (Figure 2) and Pará, Brazil, in Kew Gardens, England, and in the Berlin Botanical Garden.

From the 18th to the 20th century, rubber sparked growing economic interest. Portuguese colonisers in Northern Brazil produced waterproof boots in the 18th century. By the mid 19th century, products such as waterproof clothing and galoshes were being distributed by Latin American and US merchants. The emerging rubber industry developed along with advances in knowledge about the latex coagulation process and the dissolution of rubber, whose thickness, when varied, enabled the manufacture of different kinds of objects. Among the achievements of the laboratories, vulcanisation using sulphur, discovered by Goodyear in 1844, stood out due to the resistance and hardness it lent to rubber.

[5] C.M. de la Condamine, *Dossier biographique* (Paris: Institut de France-Academie des Sciences), doc. 15, 31. https://www.academiesciences.fr/pdf/dossiers/Condamine/Fonds_Condamine.pdf

[6] W. Dean, *A luta pela borracha no Brasil* (São Paulo: Livraria Nobel, 1989), 33.

Figure 2. Hevea brasiliensis, *collected by Adolpho Ducke in 1933 (courtesy of Barbosa Rodrigues Herbarium Collection, Rio de Janeiro Botanic Garden).*

Rubber became an irrepressible instrument of technological innovation, fetching high prices on the international market. The worldwide expansion of the telegraph, for example, caused a huge demand when rubber was applied to transmission wires in 1874. In that year, England imported 58,710 kilograms of rubber from the Amazon, six times more than it had imported two decades earlier. This demand caused a latex rush, with collectors flocking to Amazonian forests.

The boom was on, followed by the inevitable bust. Attracted by profits, many rubber tappers submitted to poor working conditions comparable to captivity, while indigenous inhabitants of the region resisted or avoided extractivist demands. As rubber became Brazil's primary export product, the rubber trees began to wither in the fields, threatening latex production capacity. The old extraction method was questioned and cultivation of *Hevea* became more attractive. Nevertheless, in Brazil extraction was still seen as the most viable way to collect latex on a large scale and move it quickly to port. In 1881 in the Rio de Janeiro Botanic Garden, João Barbosa Rodrigues took the initiative to plant rubber trees. His tests established that *Hevea brasiliensis* was the variety best suited to latex production. In Europe, Kew Gardens had been performing similar acclimatisation tests.

The British colonial rubber boom in Asia of 1910–11 was based on seeds from Brazil, however. *Hevea brasiliensis* seeds obtained in Brazil were transferred not via official diplomatic means, as was customary, but surreptitiously by an English explorer named Henry Wickham who had lived for many years in the Amazon.

While the British rubber plantations in Asia were still doing well, in Brazil in the 1920s, the government of the state of Pará established a land grant system. One million hectares in the Tapajós valley were ceded to W.L. Reeves Blakeley for the Ford Motor Company, which permitted 'the use of the land to exploit native rubber trees and intensive planting of rubber trees'. The concession was operated by Companhia Ford Industrial do Brasil, which, to set up its operations, founded the city of Fordlândia. In 1934, the company negotiated an exchange of land, near Santarém, named Belterra. The Americans sought to develop *Hevea* agriculture and study its chemical processing. The botanist Adolpho Ducke, working for the Rio de Janeiro Botanic Garden on the American project, studied the geography of the different and best rubber species and sought to identify the plant that could solve issues related to latex processing, coagulation and concentration. For the latex concentration problem, the creaming methods patented in 1923 and 1924 in Germany and England, which involved adding colloidal materials, predominated. The Fordlândia technicians undertook a broad search of Amazon plants to find a creaming agent that was abundant in the region. Ducke noted that the local people used the seed of the *jutaí* tree. The result of the research was latex creaming on an industrial scale.

Despite the industrial expansion obtained with rubber, local techniques of latex preparation persisted in some areas of both Mexico and Brazil. During the expedition of 1938 headed by Claude Lévi-Strauss, which produced the classic work *Tristes Tropiques*, Brazilian National Museum anthropologist Luiz de Castro Faria photographed children playing with a rubber ball and wearing rubber boots made by local inhabitants. He also photographed smoking and curing of latex and loading of processed rubber to be shipped to the export port. In 2007, in a meeting of the Brazilian Society for the Progress of Science (SBPC), held in Belém, the chemist Fernando Galembeck stated that only now in the 21st century, with nanotechnology, have chemists been able to perfect the qualities of natural rubber. However, the material and the preparation process remain the same traditional ones photographed by Luiz de Castro Faria in 1938.

The boots acquired by Castro Faria during that expedition were part of the ethnological collections of the National Museum in Rio de Janeiro. Sixty years after taking those pictures, Castro Faria published them in the book *Um outro olhar, diário da expedição à Serra do Norte, Mato Grosso, 1938* (Figure 3).[7] The boots, however, disappeared 70 years after they had been added to the museum's collection, along with the 20 million scientific objects gathered over two centuries of research in the natural sciences in Brazil that were consumed by the fire that destroyed the National Museum in September 2018.

[7] L. Castro Faria, *Um outro olhar: diário da expedição à Serra do Norte* (Rio de Janeiro: Ouro Sobre Azul, 2001).

Figure 3. Photographs by Luiz de Castro Faria, 1938 (courtesy of Arquivo Luiz de Castro Faria, Museu de Astronomia e Ciências Afins (MAST)).

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SILVER BASIN

Mariana Françozo

Every first Sunday of the month, the staff of the frugal Protestant *Nikolaikirche* in the small town of Siegen, Germany, prepare the church for a special service. Next to the usual arrangement of simple wooden chairs aligned in neat rows inside the typically undecorated, white-walled church, a uniquely ornate object is taken out from the church's collection. It is a gilded silver baptismal basin, about 54 cm in diameter, 12.3 cm high and weighing about five kilograms, with a frieze seven cm wide adorned with houses, animals, monsters and four medals. Its 7.8 cm base sports an inscription in Latin on the bottom, which reads: *Johan Maurits, Count of Nassau, inaugurated in 1658 for use in the holy baptism of the Reformed Church of Siegen this gift which he, as governor of Brazil, received from the African king of Congo.*

Baptismal basins are common items found in any Christian church. But the Siegen basin is a unique piece of work whose history and trajectory perfectly exemplify the global connections that brought together Andean miners and metalworkers, European and American slave traders and African rulers during the early modern period. The first point to note is that the basin is made of silver. For centuries China was the primary end market for silver, due to the higher value of silver there compared to other places. The discovery and industrial development of silver mines at Potosí in the 1540s transformed the world economy, oiling the wheels of a global trade that connected Peru with Europe, Africa and Asia. Indeed, Potosí was the world's leading silver producer until the middle decades of the 17th century, when it was overtaken by Mexican mines. Hispanic American silver flowed around the world in both minted and luxury forms. In this context, an enormous quantity of fine silverwares was transported from Spanish America to Europe, Africa and Asia. Part of this global trade, the Siegen basin made three transatlantic journeys.

The origins of the basin were the subject of curiosity and debate already in the late 17th century. In the November 1693 edition of his monthly periodical *Monatliche Unterredungen*, German polymath Wilhelm Tentzel published a piece on the basin.[1] Inspired by the dialogical genre found in classical philosophical works, Tentzel's text takes the form of a disputation among three friends: Antonio, Leonardo and Constantino. The three debate whether the Siegen basin is of American or African origin, taking the 'hieroglyphs' engraved on its frieze as a starting point. After pages and pages of baroque erudition, they fail to reach a consensus. The question remained as to whether the 'hieroglyphs' were Mexican, Peruvian or Congolese. In the mid 19th century, historian Ludwig Driessen studied the basin, concluding that

[1] W. Tentzel, *Monatliche Unterredungen einiger Guten Freunde von Allerhand Büchern und andern annemlichen Geschichten* (Leipzig: J.F. Gleditsch, 1693).

it was clearly the work of Italian craftsmen. In the hundred years that followed, scholars and historians proposed other hypotheses: it was an Italian basin produced to be exported to Africa, an African piece made by Benin craftsmen or a Portuguese piece made in Congo or Portugal.

In the 20th century, German historian Friedrich Muthmann noted a striking similarity between the images of llamas and monsters on the basin and the drawings found in Felipe Guaman Poma de Ayala's recently discovered *El primer nueva corónica y buen gobierno.* Guaman Poma's manuscript or *Letter to the King* was addressed to Philip III of Spain but was considered lost until the early 20th century, when it was located at its present repository, the National Library of Denmark in Copenhagen. For this reason, the manuscript could not have been consulted either by Tentzel in 1693 or by Driessen in the 19th century.

As far as the dating of the basin is concerned, a closer look at the frieze is very revealing. At the outer rim of the frieze, a few tiny engravings in the form of crowns are accompanied either by the year 1586 or by the initials *P.H.* set between two thin lines. These can be interpreted as the initials of Philip II (1527–98), king of Spain and the Indies. The small crowns appear to be a later addition to the frieze, possibly denoting a crucial moment of unity in the history of the Iberian empires. Between 1580 and 1640, the kingdoms of Portugal and Spain came under the same dynastic line of Spanish Hapsburg rulers. Upon the death of Henry of Portugal in 1580, a succession crisis was set in motion that ended with Philip II's claim to the Portuguese throne, initiating a 60-year period under Philip II, Philip III and Philip IV that became known as the Iberian Union. Philip II's claim to Portugal and her Indies empire was supported by Portuguese merchants, groups of nobles and other interests attracted by expanded trade with the Spanish empire and access to American silver.

About a decade later, the Hispanic monarchy would regularise the commerce between Portuguese Africa and Spanish America by granting special contracts called *asientos*. These contracts gave exclusive rights to Portuguese merchants to participate in the slave trade to America. As a result, Portuguese slave traders and merchants gained control over the Spanish American slave trade and established the largest slave market in the Atlantic. Portuguese merchants dominated the route between the west coast of Africa and the Spanish colonies in the Americas, selling slaves who endured the transatlantic journey from the region of Congo to the Río de la Plata basin, then to Buenos Aires and finally up the Andes to Potosí.

In this context, while the engravings of monsters and llamas suggest that the Siegen silver basin was originally made in Upper Peru and the year 1586 indicates its latest possible year of production, the small crowns with the initials of Philip II suggest that the silver basin was used as an official payment method in the slave trade. This is likely how the basin made its first transatlantic journey: taken along the route from Potosí to the west coast of Africa, it served first as payment to Portuguese *asienteros* for a supply of slaves brought to Potosí. It was then used as payment by these same Portuguese merchants to African slave-holders to procure another shipment of slaves in Congo. This is likely how the basin ended up in the hands of the king of Congo. The basin's second journey across the Atlantic can also be explained with the help of the Latin inscription's reference to Johan Maurits of Nassau, governor of Brazil. A German nobleman with extensive military training and courtly education, Johan Maurits van Nassau (1604–79) was governor of the Dutch colony of Brazil between 1637 and 1644. During that period, he resided in the port city of Recife, overseeing all matters pertaining to the administration of the sugar-producing colony of Nieuw Holland, including the slave trade with West Africa. For this trade, the Dutch relied heavily on Brazilians' and Luso-Africans' expertise in the business. During his eight-year tenure in Brazil, Maurits put together one of the most interesting collections of curiosities of the early modern period. Like all such collections at the time, it was composed of *naturalia* and *artificialia*. In Maurits's case, many objects in his collection were acquired not only in Brazil but as a consequence of his position as governor-general. That is, his collection was augmented by diplomatic gifts.

Maurits took advantage of the diplomatic custom of gift exchanges to establish relationships with Dom Garcia II, the Christian king of Congo, and Dom Daniel da Silva, the count of Soyo (then called Sonho), both of whom ruled over important African slave-exporting regions. By the time Dutch troops broke

Figure 1. Baptismal silver basin (courtesy of Siegen Evangelical Church, Germany).

the resistance of Portuguese forces in the interior of Brazil in 1635, there was a significant shortage of slaves in the colony, which stimulated direct trade with the slave-supplying regions of Western Africa. Slaves were strictly necessary to maintain the sugar-production ambitions of the Dutch West Indian Company. In the early 1640s, both the king of Congo and the count of Sonho sought Maurits's support in a dispute with one another. In this context, both African rulers sent gifts. In May 1643, the king of Congo sent his representatives to Recife, offering Maurits 200 slaves, a necklace and a silver basin. This was the Siegen silver basin's second transatlantic journey. In recognition of the gift, Maurits sent to the king of Congo a long silk cloak with golden and silver embroidery, a satin doublet, a hat made of beaver fur and a sword adorned with silver. Upon returning to Europe in 1644, Maurits took all his possessions and his collection of curiosities with him. The basin was part of the heavy cargo transported in one of the 13 ships destined for the Netherlands, thus making its third transoceanic voyage.

Back in Europe, Maurits became governor of Cleve in Germany and in 1658 attended the election in Frankfurt of Leopold I (1640–1705) as the 46th Holy Roman emperor. While in Frankfurt, he hired the services of a goldsmith to coat the basin in gold, engrave it with his coat of arms and add a base with an inscription commemorating the event. That same year, Maurits presented the basin to the Protestant church in Siegen, where it rests today.

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FEATHERED SHIELD

Linda Báez Rubí

*Figure 1. Yacatecuhtli (*Florentine Codex, *chapter 19, fol. 17r).*

In his *General History of the Things of New Spain*, Fray Bernardino de Sahagún (1500–90) describes a feathered shield with a fret design at the centre, an attribute, apparently, of Yacatecuhtli, god of traders (Figure 1).[1] This design matches those of a pair of feathered shields held in the Landesmuseum of Württemberg, Germany (Figures 2 and 3). How did they get there? What did Germans make of them?

What do we know about the ancient Mexican feathered shields? Sources from the 16th century show Aztecs with plain warrior shields for combat, gala shields for feasts or dances and other shields exhibiting the insignia of the supreme war chief. The *Codex Mendoza*, for example, suggests the *xicalcoliuhqui* fret ornament shield was for warriors who had captured more than five prisoners and distinguished themselves in battle. Other depictions of the shield are found in the *Historia natural de las Indias* of Diego Durán (Figure 4). These help us understand the various uses of the *xicalcoliuhqui* shield before the Spanish conquest.

Both shields held in the Landesmuseum Württemberg were made before the Spaniards

[1] Bernardino de Sahagún, *Florentine Codex: General History of The Things of New Spain,* ed. by Charles E. Dibble and Arthur J. O. Anderson (Santa Fe, NM: School of American Research and the University of Utah, 1961), lib. 1, p. 44.

 

Figures 2 and 3. Feathered shields, Aztec, c.*1520 (Inv. [E 1402] Friedrich I of Württemberg (1557–1608); courtesy of Landesmuseum Württemberg, Germany).*

reached Tenochtitlan, the imperial city of the Mexica or Aztecs, and conquered it two years later, in 1521. Once he reached Veracruz in 1519, Hernán Cortés (1485–1547) shipped back to Emperor Charles V objects made of jade and silver and richly decorated shields and featherwork as tribute to the Spanish crown. Understood as 'political gifts', these artefacts helped justify his aims and claims. In addition, war artefacts were esteemed as precious spoils of conquest or as signs of loyal submission. Charles V displayed the precious objects sent by Cortés when celebrating his coronation as Holy Roman emperor in Brussels in 1520. The precious artefacts stirred awe and curiosity among humanist scholars and artists, such as Albrecht Dürer (1471–1528), who had attended the coronation. Dürer recounts that he was left speechless before 'wonderful things made with great artistry' in the 'golden chamber of the town hall'.[2] There he 'wondered about the subtle inventiveness of the people of foreign lands' who had made them.

It is unclear if the feathered shields in the Landesmuseum were among the items shipped by Cortés to the Holy Roman emperor and king of Spain. Notably, the museum label displayed at the entrance of the exhibition room where both shields are held presents neither de Sahagún's description of them nor any other 16th-century Mexican source. Instead, the visitor is presented with the account of the diplomat and art collector Philipp Hainhofer (1578–1647). Hainhofer had visited the courtly collection of Duke Friedrich I of Württemberg (reg. 1593–1608) in 1616. The account includes the following excerpt:

> The chamberlain led me into the tower and opened two rooms, inside were two Indian armours, drinking utensils, snails, shells, giant legs, a whole human skin . . . The head of a unicorn, ostrich eggs, turtles, crocodiles, fish and different animals hanging high up in the air . . . In summa, there are so many beautiful things on top of each other that it took a long time to see everything.[3]

[2] Albrecht Dürer, *Tagebuch der Reise in die Niederlande,* in *Dürer Schriftlicher Nachlass,* ed. by Hans Rupprich (Berlin Deutscher Verein für Kunstwissenschaft, 1956), vol. 1, 154.

[3] Letter from Hainhofer to Duke Philipp II von Pommern-Stettin, 1616, https://blog.landesmuseum-stuttgart.de/wieder-wunder-in-der-kunst-und-wunderkammer/

Figure 4. Detail from Codex Durán, *chapters 9, 10 and 11, laminate 7 (1867).*

Figure 5. Unknown artist, Triumphal Entry of America, *29.9 × 55.5 cm (Klassik Stiftung Weimarer/Graphische Sammlung, KK207).*

Hainhofer's description of his experience in the Duke's *Wunderkammer* was typical of the age, when collecting was less about systematic classification and more about assembling a trophy chest of curiosities and wonders. As was common during the period, the duke did not hesitate to display and in some cases gift his treasures to further his diplomatic relations with courts and gentleman scholars. Most notably, the duke decided to parade his feathered shields in tournament dramatisations of 'the triumphal entry of America' (Figure 5).

The performative insertion by the duke of the actual shields in a performance likely based upon the Protestant engraving entitled *Quae pompa delecta ad Regem deferatur*, published by Theodor de Bry in 1591 (Figure 6), adds a vital element of authenticity otherwise lacking in de Bry's fanciful image.[4] Here the shields take their place in a symbolic act of Protestant religious war.

In his chronicle *Beschreibung deß Fürstlichen Apparatus, Königlichen Auffzugs/Heroischen Ingressus und herrlicher Pomp und Solennitet*, Jakob Frischlin relates how at the Stuttgart Castle the personification of America made her way towards Protestant Duke Friedrich, in the hope that he would release her from Spanish Catholic subjugation.

The chronicle tells us that members of the court dressed in elaborate costumes and carried the feathered shields when performing the triumphant entry of 'Queen America'. Dressed in feathers, Queen America gathered together with her sisters, Europa, Asia and Africa. All came expressly to visit and praise Duke Friedrich I in Germany: '*Und wolt jetzt auch ins Teutschelandt/ Daselbsten ein Fürst Hochgeborn/ Zu aller Tugent außerkohrn/ Fridrich so wirdt sein Nahm genandt/ Hertzog von Würtenberger Landt*.'[5]

It is likely that the shield was simultaneously intended to evoke in the spectator's mind the image of Aeneas's shield and in so doing presage the glory of the ruling house. The shield made for Aeneas had presaged Rome's future, and it contained propaganda for the Emperor Augustus. It is not by chance that

[4] *Brevis narratio eorvm qvae in Florida Americae provincia Gallis acciderunt, secunda in illa nauigatione, duce Renato de Laudonniere classis praefecto* (Wecheli sumtibus vero T. de Bry, venales reperiutur in officina S. Feirabedii, 1591), plate 37.

[5] J. Frischlin, *Beschreibung deß Fürstlichen Apparatus, Königlichen Auffzugs/Heroischen Ingressus und herrlicher Pomp und Solennitet* (Frankfurt am Main, 1602) 130.

Duke Friedrich I also decided to integrate Daniel's biblical prophecy into the performance through the allegorical personifications of antiquity's universal rulers: Nimrod (Babylon), Cyrus (Persia), Alexander the Great (Greece) and Julius Caesar (Rome). These Old Testament biblical rulers now paid homage to America. Daniel's prophecy was the basis of the 'Four World Monarchies' scheme that had dominated European periodisation and prophecy about the rise and fall of world empires. The Four Monarchies model, as a theological interpretation of history, conceded that powerful earthly kingdoms that fell in moral decay should be replaced by the kingdom of God. This eschatological reading of history was widely deployed by Protestant electoral princes against the Holy Roman emperor's universal imperium, and indeed this reading informs the drawings of de Bry and our unknown artist. This princely discourse promoted a new territorial and Christian order, where the *ambitio regnandi* of the Catholic rulers would not only be morally admonished but replaced (as Queen America demands from Duke Friedrich I) with good government and true religion under Protestant rule.

The Protestant deployment of the shields reminds us that collections are far from innocent or static assemblages of dead objects with fixed meanings. And that is why the two shields are still held in a museum in Germany.

Figure 6. De Bry, Quae pompa delecta ad regem deferatur *(1591).*

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BLACK

Adrian Masters

Two groups of stately gentlemen look our way from a long table decorated with an Anatolian tapestry (Figure 1). Both are dressed in the early modern Spanish style – simple pitch-black robes and white ruffs. An untrained observer in the 16th century might have assumed that these men were all from the Spanish monarchy's highest councils. They certainly looked the part.

But the participants' dignified and calm expressions conceal a crisis and a fierce rivalry. The year was 1604, and these two groups were adversaries, gathering to negotiate the end of a long and bruising conflict over European and New World dominance. The cohort on the left represented the Spanish crown, yes. But the almost identical one on the right was British. They were meeting at Somerset House in London in 1604 to sign a peace treaty and end decades of New World warfare and intrigue. Though these governments were at odds, both their officials' clothing styles and their designs for overseas supremacy were nearly indistinguishable.

These diplomats' black robes were also bound up in the imperial struggle. The Spanish Habsburg court had an obsession with black-hued clothing, a trend it exported to Britain and all of Europe starting in the 1550s and 1560s. This Habsburg fashion was bolstered by a certain tropical dyewood from the Yucatán, *palo de Campeche* (historically called simply *palo campeche*), or Campeche wood. This plant's rich dye made it popular in classical Maya high society, a staple of the Spanish golden era's black fashion and, only decades after the 1604 Somerset House conference, a trigger for bloodshed in the Caribbean.

The reverberations of these imperial struggles are felt even today, for Maya-, Spanish- and English-speaking loggers remain in Mexico and Central America where their ancestors felled these trees centuries before. Black's era of Spanish glory from roughly 1550 to 1650 also indelibly marked the fashion world then and now. After a brief and colourful French interlude, black has reclaimed its place as the foremost shade of high fashion and statecraft. And while palo de Campeche is now largely obsolete due to synthetic dyes, the tree's creeping invasion of the Old World tropics suggests that of all the empires at the table in Somerset in 1604, palo de Campeche's may be the longest lived.

In the early to mid 16th century, Europe was on the search for the perfect black dye. From antiquity to the 1200s, black evoked all things 'dirty, sad, gloomy, malevolent, deceitful, cruel, harmful [and] deathly'.[1] By the late 1200s, increasingly powerful lawyers and judges in Italy, France and England, as well as religious orders like the Dominicans, embraced the tone, most likely for its association

[1] M. Pastoureau, *Black: The History of a Color* (Princeton: Princeton University Press, 2008), 35.

Figure 1. Somerset House Conference, 1604 (courtesy of National Portrait Gallery, London).

with frugality, moral gravity and dignity. Merchants and aristocrats soon embraced black fabrics that were deemed simultaneously austere and opulent. Indeed, in the 1400s black clothing was replacing its wildly expensive scarlet alternatives as the favoured hue of European princes and aristocratic men.

During the 15th century the Spanish court had selectively embraced the hue. When the Austrian Habsburg dynasty ascended the throne in 1506, its black-clad Burgundian courtiers brought Europe's craze for black fashion to fever pitch. Spanish style had long been influential throughout the Catholic world and beyond, but by the 1520s the Spanish court had become a true epicentre of fashion. Whatever its courtiers wore, Europe wore – Britain included.

Beginning in the 1550s, Hispanic King Philip II's unmistakable style established the fashion of combining black robes with white ruffs. By the 1560s, some women, and especially men, adopted this fashion – and not only in Spain, Portugal and Britain. The Viennese, the Bohemians, the Hungarians, the Transylvanians and the Swedish, among others, breathlessly awaited shipments of the latest Spanish styles. Spanish Habsburg processions stunned even the fashion-forward and colour-loving Northern Italians and Tuscans. Everywhere in Europe, women used black as a striking contrast against their gold jewellery and pearls, while retaining colourful fashions. On the other hand, high-ranking men almost entirely embraced this hue as an administrative and aristocratic uniform.

Figure 2. Portrait of Hasekura Rokuemon Tsunenaga, 1615, in prayer, wearing typical Habsburg court attire during his travels from Sendai to the Vatican (courtesy of Sendai City Museum).

In subsequent years high-ranking Christians around the world embraced courtly black. Among New World officials and nobles, it spread quickly. The Portuguese carried this fashion to their outposts in Goa and Macau. And by the early 1600s, some Japanese converts to Christianity like the samurai courtier Hasekura Rokuemon Tsunenaga (支倉六右衛門常長) of Sendai, who travelled to Spain and the Vatican by way of Mexico, adopted the austere Spanish fashion, as shown in his 1615 portrait (Figure 2). In the Spanish Habsburg global sphere of imperial and cultural domination, 'black held the highest position'.[2]

It was the golden age of black. However, the Europeans caught in this craze faced a problem. Dye-makers could only produce a deep, uniform black from oak apples, which were very difficult to procure. Despite their name, these were neither fruits nor oak proper – they were sap-covered wasp larvae. These gall-like protrusions were also only common outside of Western Europe. Alternatives to oak apples were almost always mediocre and required repeated dyeing to achieve a deep tone – and this process often destroyed fabrics. Perhaps the prestige of black was due to these dye-makers' difficulties in obtaining the perfect midnight shade.

Part of the mystique of the Spanish Habsburg court was its signature 'crow's wing' black clothing. This had a deep, lustrous blue tint and lacked the brownish shade of earlier dyes, including oak apple blacks. A major source of Spain's rich black hues came to Europe from the faraway Yucatán peninsula, where in the mid to late 1500s Mayans, Spaniards and other groups eked out a difficult living under the blazing heat. Here in southern New Spain or Mexico, especially in its namesake Campeche region, palo flourishes. This tree grows best in tropical lowlands, especially where rivers and marshes meet hillsides. Palo is gnarly and bush-like, with flaky bark, normally growing only to some 25 feet. It sprouts heart-shaped leaves and racemes of small yellow flowers (Figure 3).

Palo wood has received over 60 names, thanks to its ability to produce many colours, from yellow to red to purple to black. The Mayans call it *ek*, the British 'logwood' or 'campeachy', and the Spanish *palo de tinta, palo de Campeche* or simply *palo*. In Linnaean taxonomy, it is *Haematoxylum campechianum,* the 'bloodwood of Campeche'. The tree's heartwood lives up to these labels. When split into small pieces and boiled in water, it bleeds the reddish haematoxylin (Figure 4). This substance, if exposed to the proper mineral agents or mordants, produces a rich blue-black. Other additives yield, in the 1704 words of German doctor Michael Bernhard Valentini, 'an indescribable range of colours' from brilliant yellow to purple.[3]

Pre-classical Mayans had used the wood since at least 400 BC. In classic period Yucatán (AD 250–900), black paint, most likely derived from palo, appeared in the portraits of powerful lords. Black had multiple connotations for the classical Maya; they associated it with the western cardinal direction,

[2] M. Pastoureau (2008), *Black: The History of a Color* (Princeton NJ: Princeton University Press), 133.

[3] M.B. Valentini, *Museum Museorum, oder Vollständige Schau-Bühne aller Materialen und Specereyen* (Frankfurt am Main: Verlegung Johann David Zunners, 1704).

Figure 3. Haematoxylum campechianum *in a 19th-century botanical guide (public domain).*

as well as with death and sterility. Black dye was also fashionable; indeed, palace elites embraced it long before Europeans. Courtiers carefully applied black make-up to their faces, especially their eyes and lips, in pursuit of a striking aesthetic impact. Ball players, young unmarried men, warriors and those undergoing fasts also often coated their bodies in black stripes, or even entirely in black. Before and immediately after the conquest, Mayan women and men continued dyeing their clothing with the wood.

Spaniards invaded and settled the Mayan Yucatán in the 1540s. As they struggled to adjust to Campeche's landscape, some turned to palo de Campeche as a means of survival. Conquistador Marcos de Ayala received a royal grant of Indian labour tribute, but when the local Maya revolted against him and left the region, he improvised. Sometime in the 1540s he began experimenting with palo, surely with the help of Mayan acquaintances. In the 1560s and 1570s, he petitioned the viceroy of Mexico and the Council of the Indies for a ten-year monopoly on the wood. He first travelled to Mexico City, where he brought master dye-makers before the high court and viceroy to demonstrate the dye's 'perfection' and its perfect adhesion to silk and other fabrics. Ayala had already begun exporting it to Spain and even Peru. Indeed, by the early 1560s merchants in Seville were informing him that the wood's value was increasing exponentially in Europe. One official wrote from the capital of the Yucatán, Mérida, with excitement, that

Figure 4. Chips of Haematoxylum campechianum *wood before chemical treatment (courtesy of Alamy Stock Photo).*

Ayala's discovery promised to yield great profits in Spain's 'kingdoms, and in Flanders, Germany and England, and other states'.[4]

The Yucatán entrepreneur persuaded the crown that he was *palo de Campeche*'s 'inventor'. It was to be a short-lived victory. In the 1570s procurator Juan Arévalo de Loayza of Mérida complained that palo de Campeche was not Ayala's discovery since it had been 'freely harvested' by Indians and Spaniards for decades.[5] The governor ruled this monopoly unjust to both peoples, and when Ayala's son petitioned to renew the privilege, the Council of the Indies rejected his request.

Ayala may well have pioneered a method to make palo de Campeche's haematoxylin compound bond to fabrics, which other Europeans struggled to achieve. In 1575 the Italian Francesco dalle Arme claimed that his fellow countrymen regarded the dye as 'false and lying' because its blue variation did not fast as perfectly to fabrics as indigo, *Isatis tinctoria*. However, Arme claimed to have a chemical solution to the problem.

The Council of the Indies asked Yucatán officials to investigate Arme's claims. The royal magistrates did not find the dye to be weak. It provided an excellent black, which was their main concern. Moreover, these authorities reported a robust demand for the wood in Europe. Over 30,000 quintals (1.38 million kilos) had gone to Spain in the past eight years. The real problem with palo, they warned, was that foreigners in Seville were monopolising and hoarding the dye for resale at excessive prices. This is probably why the crown balked at the Italian's request to receive 20 per cent of all arriving palo as a reward for his chemical discoveries.

Many Spaniards believed their global commercialisation of palo de Campeche would bring the empire riches, as well as moral and geopolitical superiority. The dye from this tree was capable of imitating the blues of indigo, a monopoly of their rival, France. In addition, Emperor Charles V feared that purchasing black-producing oak apples from hostile Islamic powers went against his conscience and hindered his war efforts.

By the 1560s, then, palo de Campeche was not merely lending a special sheen to the Spanish court; it was consolidating the empire. Spain had broken free from dependence on the monopolies of her enemies with this and other dyes. Mexico exported more than 3.68 million kilos of palo in 1598. At the rate Ayala was selling his heartwood, four ducats a quintal (46 kilos), merchants were probably selling some 320,000 ducats' worth. This sum was more than the empire's average yearly tax revenue from the entire New World for the years 1510–50. One scholar has suggested that during the 1600s, palo became the second most valuable Caribbean product after sugar. Whether this product reached Asian markets in large volumes during this period is unclear, but its profits certainly strengthened the mercantile networks which were linking Europe to the Far East through Mexico.

Already by the late 1500s, Spaniards eager to make a profit were attempting to force Mayans to harvest the wood. The 'royal protector and defender of the Indians' Francisco Palomino warned that local elites obligated Indians to travel many miles to work the tree along its riverbank habitats. Their axes often splintered against its hard wood, he warned, causing 'many deaths of Indians'.[6]

What many Indians made of the Spaniards' black fashion demands further study. In central Mexico, local Indian elites took on Spanish clothing, with men often adopting black robes with white ruffs. This was likely a trend throughout the Indies, although we often cannot determine precisely who wore what. Certainly, the many Indians from Mexico, New Granada, Quito, Peru and beyond who visited Madrid would have donned the court's attire. Meanwhile, by the 1560s black clothing had reached another court – that of the sovereign Inca ruler. Spanish officials in the Peruvian Andes employed sartorial diplomacy to bolster treaties with the Inca ruler Titu Cusi Yupanqui, who adroitly refused Spanish rule and had his own dominion deep in the Eastern Andes stronghold of Vilcabamba, beyond Machu Picchu. Peru's governor Lope García de Castro, hoping to win the Inca's trust and perhaps secure his surrender, sent his rival black velvet clothing embroidered with fine

[4] AGI, Mexico 98, 'Justicia que a hecho', 20 February 1565, Doctor Diego Quexada.

[5] AGI, Patronato 64, R.7, 90r–92v.

[6] AGI, Indiferente 1391, 'Franco Palomino', 1580.

gold threads. The sovereign thanked the governor effusively for the gifts – though what the Inca really made of this fashion is hard to say.

The craze for Spanish black fashion certainly spread rapidly in Europe – even as religious warfare began to tear the region apart. In the early to mid 1500s, mortal enemies Emperor Charles V and Martin Luther had both adopted black, attracted by its grave monastic symbolism. With King Philip II in power, British, Dutch and Bohemian Protestant men not only donned sombre Spanish robes but adopted the court's ruffs, coats, cloaks, stockings and other trademark styles. Even Gustavus Adolphus, an indefatigable enemy of Catholics, was a devoted Hispanophile in his sartorial choices. A warring Europe had come to a rare consensus for black.

Spain's imperial asset soon drew unwanted attention to its Yucatán dominions. As Europe's interest in palo rose, Spain's Caribbean society had become, in the 1666 words of the British duke of Albemarle, 'very weak and very wealthy'.[7] Trouble soon began to ferment in Campeche's swamps. The British, who in the early 1600s were still novices at imperialism, found that the wood provided them with a foothold on the Caribbean mainland. The Bermudans' sale of one stolen shipment of palo de Campeche alone provided double the profits of the struggling island's tobacco economy. Soon, unemployed pirates and woodcutters arrived with axes and explosives to hack and blast palo roots out of the soil. Passing British merchants bought heartwood from these loggers, often for little more than rum, before reselling it in England at extravagant prices. The famous Caribbean pirates of the so-called golden age of piracy from roughly 1650 to 1720 had found in 'campeachy wood' one of their chief sources of income.

Brits and other Europeans, eager to profit from this dyewood, began enslaving Indians and Africans to harvest it in Campeche. How much mayhem ensued is unclear, but it must have been great. One British captain enslaved several Algonquians in New England with plans to either sell them or force them to log campeachy wood. When this slave-master found no buyers in Jamaica, he sailed down the Campeche river. There, these Indians revolted and killed him, and began their tragic journey back home through Mexico by foot. What became of those Algonquians stranded in southern Mexico remains unknown.

Similar British provocations pushed Spain's empire over the brink. As impoverished British lumberjacks began exporting thousands of tons of the dyewood, they invited skirmishes with locals and triggered a long-armed conflict with Spanish authorities. The empire was not going to surrender such a profitable region without a fight. In 1660s the Council of the Indies regarded the Yucatán as its third most prized dominion after Mexico and Peru. Sure enough, the Spanish triumphed against the loggers and expelled them from Campeche by the early 1700s. However, these haggard frontiersmen increasingly turned to piracy in the wider Caribbean. They recovered their foothold by resettling in palo-rich Belize and the coasts of what are today Honduras and Nicaragua. This time, despite repeated Spanish attacks, these so-called baymen endured. In what is today Central America, they created a largely autonomous 'republican' slave-holding society outside of both Spanish and British rule.

The Spanish Empire's mid 1600s decline not only invited pirates and loggers into its prized dominions but also marked Spain's downfall from the heights of fashion. As the monarchy's stock fell, so too did black. The Thirty Years' War, Spain's economic woes and the rising financial might of Protestant merchant states rattled Hispanic Habsburg power. In the meantime, the colourful styles of the increasingly prominent French court became steadily more fashionable, not only among women but also men. The Spanish resisted this change well into the middle of the century and continued to don themselves – and their slaves – in black. For example, master painter Diego Rodríguez de Silva y Velázquez famously portrayed his slave Juan de Pareja in this style in 1650 (Figure 5). Pareja manumitted himself several years later, and, having become a painter himself, depicted various aristocrats in the same garb.

Nonetheless, Habsburg black fashion was on the way out by the 1650s. Already in the 1660s the British

[7] N. Sainsbury (ed.), *Calendar of State Papers, Colonial Series: America and West Indies, 1661–1668* (London: Longman & Co. et al., 1880), 359.

Figure 5. Juan de Pareja, enslaved, painted by his Spanish master Diego Rodríguez de Silva y Velázquez in 1650, likely in Rome. This image reveals that Habsburg black-hued fashion had currency in the mid 17th century. However, this was not to last and was already in decline throughout some parts of Europe under French influence. Diego Rodríguez de Silva y Velázquez, Portrait of Juan de Pareja *(Metropolitan Museum of Art; public domain).*

Figure 6. An early 1700s genealogy commissioned by a branch of a Tetzcoco indigenous aristocratic dynasty in central Mexico, revealing changing fashions over the centuries – from the bottom preconquest, to the black-clad 16th century, to the more colourful 17th and 18th centuries. Nr. IV Ca 3011 (courtesy of Ethnologisches Museum, Staatliche Museen zu Berlin; photo by C. Obrocki).

were mocking Spanish dress; by the 1680s, elite of both nations were clad in French styles. A whole spectrum of French blues, as well as yellows, pinks and other colours, became the rage. By the time the French Bourbons defeated the Habsburg rulers in Spain in the early 1700s, the transformation was visible throughout Europe. Its impacts transformed Indies dress as well. For instance, we see this in an early 1700s genealogy which an aristocratic family of central Mexico's Tezcoco Indians crafted to defend their royal privileges. 'Gentile' feathered sovereigns give way to Habsburg vassals whose men wore black robes, and then to the lighter and more playful French styles of the Bourbon era (Figure 6). Playfulness of hue and form had triumphed over sobriety, at least for the time being.

Black's second golden age was yet to come. By the 1790s, the republicanism of the American and French Revolutions had overthrown the aristocratic aesthetics of the 18th century. Already by the 1820s, with coal ash blanketing European cities, romanticists brooding, anti-aristocratic sentiments strong and a Protestant ethos of thriftiness prevailing, black was back. In the 19th century, simple black had become republican, workmanlike and masculine (Figure 7). Republican governments and the male business class from all of Europe, Latin America and many parts of Asia adopted the black suit, which was a peculiar mix of British capitalist fashion, French tailoring, the Croatian tie and the hybrid Burgundian-Spanish-Mayan black.

Figure 7. By the 19th century, many men in the European sphere of influence had once again adopted black coats and breeches, along with white collars, to project gravity, self-control and austerity. Here is an example of two wealthy French brothers. Men's fashion today remains remarkably similar. Hippolyte-Jean Flandrin, René-Charles Dassy and His Brother Jean-Baptiste-Claude-Amédé Dassy, *1850 (Cleveland Museum of Art; public domain).*

Spanish women of the 19th century largely continued to wear black clothing, but they were the exception. Most of Europe's middle- and upper- class women tended to don Victorian whites and French-influenced colours and prints. Black clothing's general prominence in women's fashion arose only later, beginning in the 1920s. World War I briefly doused French tastes for ornament and colour. Coco Chanel's 'little black dress' debuted at this juncture, appealing to artists and less traditionally heteronormative consumers, as well as to anyone obsessed with the modern and cutting-edge.

Basque designer Cristóbal Balenciaga was perhaps equally pivotal. After fleeing the Spanish Civil War in 1936, he began a fashion house in Paris. There, his love for the 'monastic and austere aesthetics characteristic of Catholic convents' merged with French haute couture standards (Figure 8).[8] Balenciaga's fashion house would pivotally influence Chanel, Hubert de Givenchy, Christian Dior, and many celebrities – including famous Hollywood actresses like Audrey Hepburn. Balenciaga thus helped reinvent (Spanish) black as modern aristocratic women's couture hue of choice. In 2019, curator Eloy Martínez de la Pera dazzled audiences in Madrid's Thyssen-Bornemisza National Museum with an exhibition explicitly demonstrating the link between Balenciaga's epoch-making designs and 16th-century Habsburg court fashions. Black clothing thus remains fundamental to high fashion in Europe, buttressed by the legacies of Maya palace elites, the austere 14th-century magistrates of Europe, the courtiers of Habsburg Spain and their rival Protestants. Now, the liberal-era triumphs won by little black dresses and business suits have fastened their legacies for a second time to the fabric of global consumer culture.

Palo de Campeche's late modern rebirth was not as glorious. The wood's usefulness as a dye for textiles would endure only until synthetics increasingly displaced haematoxylin between the 1850s and 1920s. Today this tree's legacy is most obvious not in fashion but in Caribbean society, where many campeachy loggers' descendants still speak and govern themselves in English. These woodcutters even feature on Belize's flag and currency. Outside of the Caribbean, historians and scientists are among a small group who appreciate the tree's importance. Biologists and other researchers very often stain cells with haematoxylin tint to improve their visibility under high-power microscopes. This process (called H&E staining) is particularly notable for its fundamental role in furthering research on cancer, contagious diseases, parasites and other maladies.

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[8] M. Walker with A.M. Balenciaga, 'The Impact of Cristobal Balenciaga', *Balenciaga and His Legacy* (New Haven, CT: Yale University Press, 2006), 15.

Figure 8. Dutch designer Catharina Kruysveldt-de Mare confectioned this cocktail dress for Balenciaga in Paris, 1951. Balenciaga's works, deeply influenced by Habsburg courtly fashions, continue to shape our dress and culture today. Catharina Kruysveldt-de Mare, 'Dress with a Tie Belt', (c.1951–2, Rijksmuseum, Amsterdam; public domain).

Despite the destruction of tropical forests around the world, which worsens rapidly with each passing year, palo is thriving from global society's general lack of interest in its numerous properties. In a somewhat sinister turn, due to entrepreneurs' efforts to cultivate palo de Campeche around the world, the tree has become invasive far from its original habitat. Throughout the tropics, from the Caribbean to West Africa, Southeast Asia, Hawaii and beyond, palo has established a presence in riverine systems not unlike those of its native southern Mexico. Time will tell what the consequences of this species' spread will be. A plant that made empires, and survived them, is now quietly putting down the roots of an empire of its own.

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SPANISH DECK

Jorge Cañizares-Esguerra

Today the French deck of 52 cards (made of series of 13 cards of diamonds, clubs, spades and hearts, including kings, queens and jacks) is the default deck. In the early modern period, however, the default was the 'Spanish' deck. This consisted of 48 cards made of series of 12 cards of cups, coins, sticks (cudgels) and swords, including kings, knights (horse) and squires. The Iberian deck came straight from the medieval Islamic Mediterranean, along with optics, astrolabes, Galenic medicine and Aristotle. The *na'ib* and the *malik* of the Islamic suit begot the viceroy and the king in the Spanish card deck. The *na'ib thani* yielded the squire. The original Islamic cards did not carry the images of the characters in the deck. The Spanish sword emerged from the Arab scimitar and the cudgel from the shepherd staff. The cup and the coin did not change; socialising drinks and trade were the common currency of Islamic and Christian Mediterranean cultures. One distinct peculiarity of the Islamic deck is that the knights and kings appeared as names in classical Arabic calligraphy, not human representations.

Theology also shaped the Iberian deck, for playing cards in the Hispanic monarchy belonged in larger political and theological worlds. The state monopoly on playing-card decks was first introduced in Spain in the 1550s by Philip II as a tax on vice. More importantly, cards served as metaphors for theology. Preachers used the trope of card tricks to explain transubstantiation. Christ as card player, betting his own life in a game of cards with Satan, illustrated the mystery of salvation. A tradition of *villancicos* or carols and *autos sacramentales* (a literary genre of morality plays) emerged that had Christ rising from the death triumphant after a game of cards with Satan and Man. One *auto* by Luis Mejía de la Cerda, published in 1625, had the triumphant resurrected Christ surrounded by a deck of 48 cards in the shape of a chain of the Hapsburg Golden Fleece.

The Spanish deck arrived in Peru as early as did Pizarro. The contract Hernán Cortés signed with Diego Velázquez explicitly outlawed any member of the large expedition to play cards or shoot dice. When the second *audiencia* or high court arrived in Mexico in 1529 to investigate Cortés, the judges slapped conquistadors with accumulated fines worth tens of thousands of gold pesos – for eight years' worth of unregulated gambling. Cortés alone was forced to cough out 12,000 pesos of gold (the price of 300 slaves). In 1530, the empress, Isabella of Portugal, regent of Spain, ordered the treasury to return all the fines taken from the conquistadors. The Council of the Indies argued that the conquistadors used gambling to remain together when surrounded by enemy Indians – not to stray into the enemy lines. Playing cards, the *cedula* or royal certificate ruled, allowed conquistadors to maintain tight defence infantry lines. By 1538, however, the new viceroy of Mexico Mendoza had imposed regulations on gambling due to the considerable turnover of

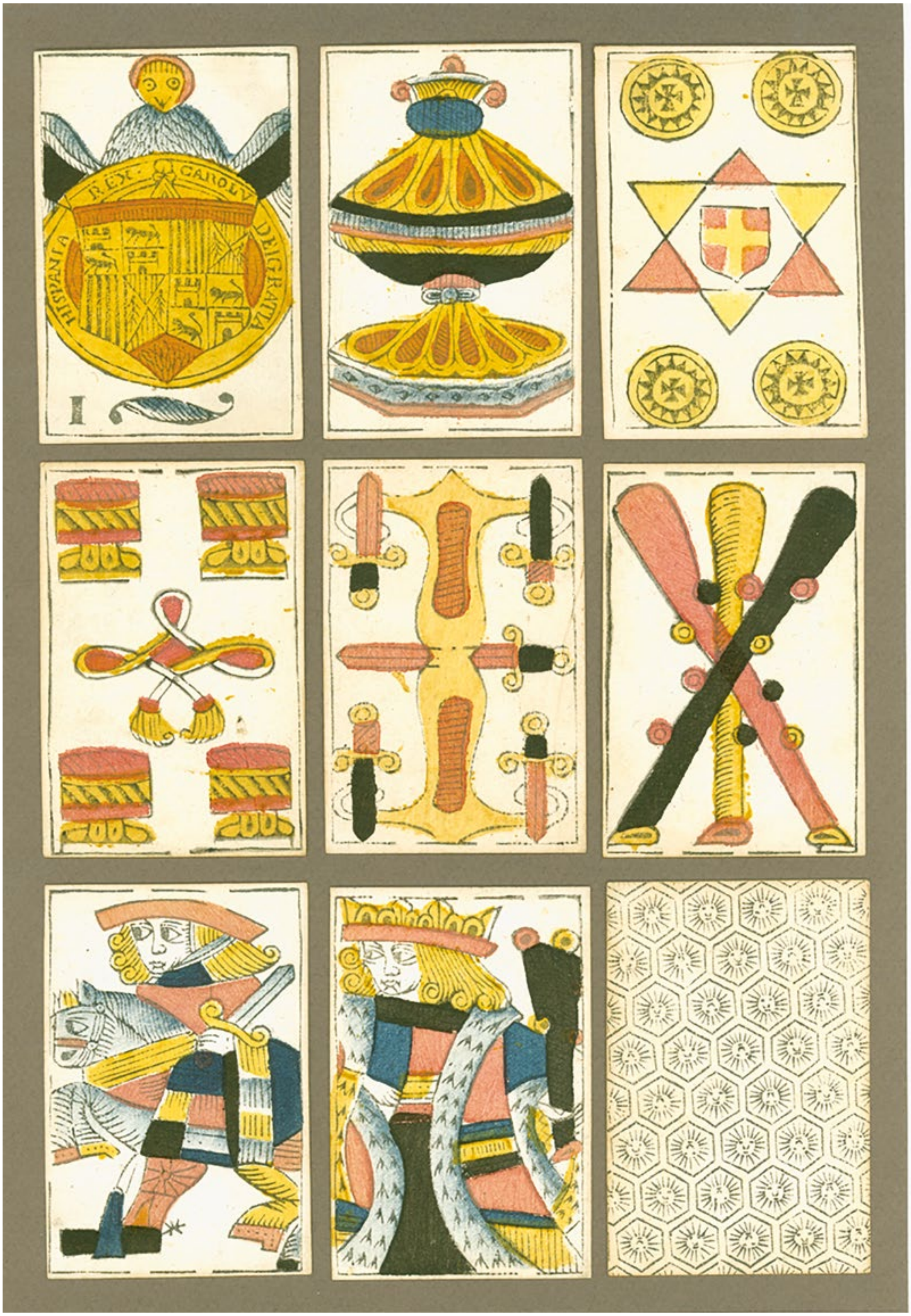

Figure 1. Jean Pouns. Decks of cards for export to Spain, 18th century (Museo Fournier de Naipes de Álava; public domain).

property and bankruptcies. Despite efforts to put a cap on bets and limit gambling, the early colonial archive regularly documents conflicts over property illegally changing hands because of card playing.

Among the earliest copies of extant printed Spanish American decks in museums are those found in excavations in Lima. There is also a copy of a deck printed in Mexico, along with the 1583 *asiento* contract of the royal card monopolies. Both the Mexican and Peruvian decks are unusual. They each have a fourth character, the dragon, along with the king, the knight and the squire, and therefore are decks of 52 cards. The Peruvian set had two kings and two queens, which might suggest an audience of Inca lords long accustomed to gender complementarity and dual kingship.

The Mexican deck also suggests the quick adaption of printers to the local demands of indigenous elites. It includes designs of Aztec games (juggling, flying poles, trained monkeys) as well as Aztec rulers and religious heroes: Cuauhtémoc, Moctezuma and Quetzalcoatl. The names of the heroes are printed in Roman script along with their corresponding Aztec logographic signs.

By 1593, Aztec lords had incorporated Christian and classical historiographies into their annals, along with new Iberian legal forms of paperwork, including wills, petitions, *probanzas* (submissions of evidence) and property deeds. The lords, to be sure, did not exclude playing cards from the new arsenal of manuscript and print culture they chose to consume. Printers in Mexico offered Christian Aztec lords striking images of preconquest Aztec *tlatoque* and *mitotes* (pole flyers and dancers in religious festivals) for ludic consumption. Printed cards of dragons, queens and pictograms and logograms of Aztec lords and religious rituals suggest a lively culture of sociability among native lords in Mexico and Peru.

Figure 2. Dragon (detail). Mexican cards – printing tests of cards made in Mexico, corresponding to the contract of Alonso Martinez de Orteguilla (F. Flores, 1583). AGI-MP-MEXICO 73-1r (public domain).

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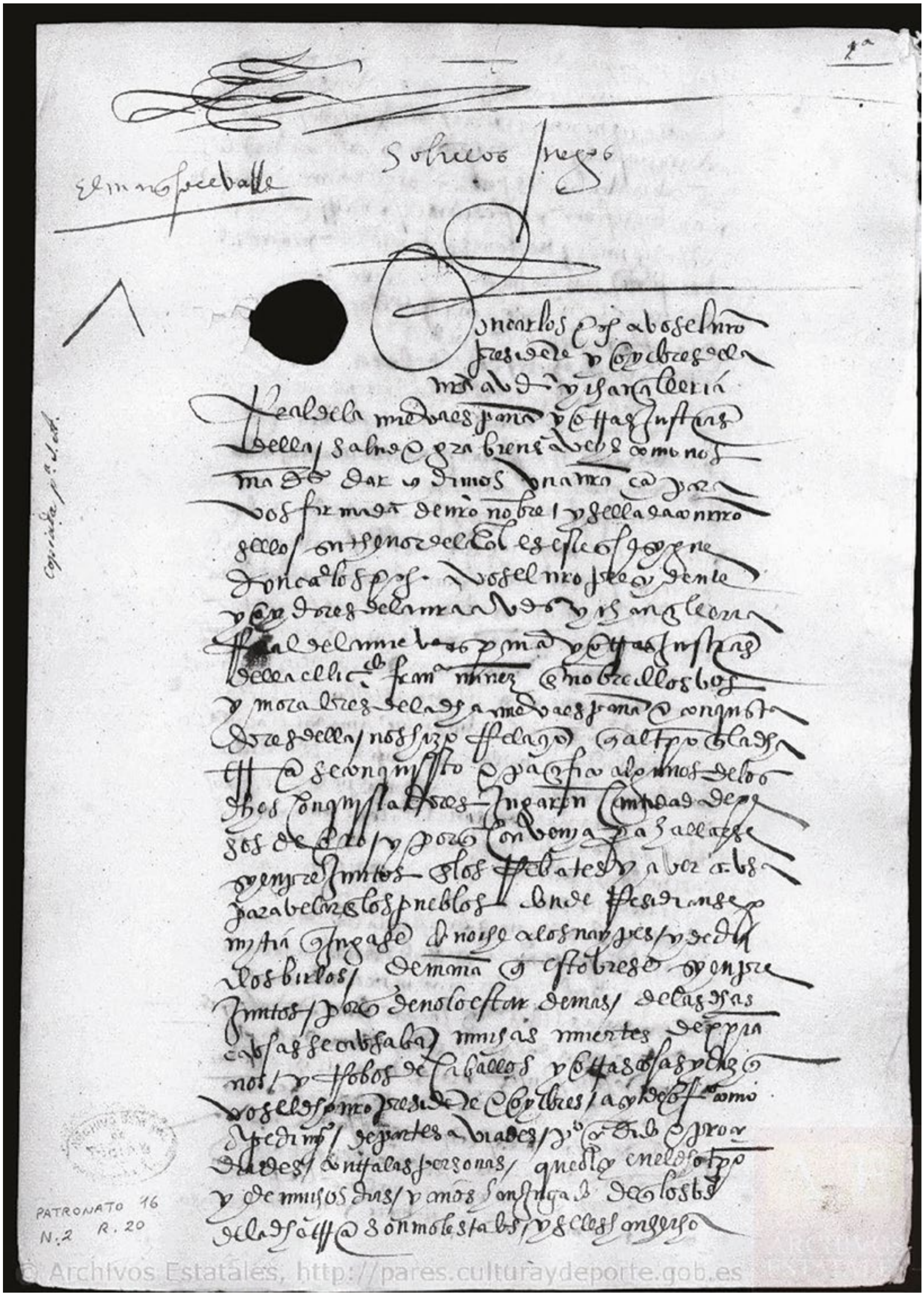

Figure 3. Royal certificate restoring 12,000 gold pesos to Hernán Cortés for fines paid relative to card playing. Marzo 11 1530-AGI PATRONATO,16, N. 2, R. 20–1 (public domain).

Figure 4. Printing tests of cards made in Mexico, corresponding to the contract of Alonso Martinez de Orteguilla (F. Flores, 1583). AGI-MP-MEXICO 73-4r (public domain).

Figure 5. Moctezuma and Cuauhtémoc cards. Printing tests of cards made in Mexico, corresponding to the contract of Alonso Martinez de Orteguilla (F. Flores, 1583). AGI-Mapas, Mexico 73-4r (public domain).

MARY’S ARMADILLO

Peter Mason

Figure 1. Detail of the Cavendish Hanging embroidered by Mary, Queen of Scots (Oxburgh Hall, Norfolk; on loan from the Victoria and Albert Museum, inv. T.30-1955; public domain).

The creature represented on this 16th-century piece of silk embroidery by Mary, Queen of Scots and labelled ‘A TATOU’ is a South American armadillo. How did Mary obtain a model for her needlework? This piece is one of 22 like it mounted, together with four octagonal panels, around a square central panel on a large green velvet hanging known as the Cavendish Hanging. It is now kept at Oxburgh Hall in Norfolk, England, on loan from the Victoria and Albert Museum of London. The Cavendish Hanging owes its name to the presence of the Cavendish coat of arms, testimony to the ties between the Cavendish family (Elizabeth Hardwick, better known as Bess of Hardwick, had married Sir William Cavendish in 1547) and Mary Stuart, Queen of Scots. Bess’s monogram appears on it three times and Mary’s once. After her forced abdication as queen of Scotland in 1567, Mary, who was Catholic, spent 16 years in the custody of Bess and her fourth husband, George Talbot, earl of Shrewsbury, in Chatsworth House, Tutbury Castle and other seats of the family. It was probably during the early years of Mary’s captivity that the two women and their staff of professional embroiderers produced most of this needlework.

Although both of Mary’s custodians were supporters of Elizabeth and staunch Protestants, Mary and Bess shared a love of flowers and an interest in natural history as well as dexterity with the needle. A letter from the earl of Shrewsbury to William Cecil reports, ‘this Queen continueth daily to resort unto my wife’s chamber where with the Lady Lewiston and Mrs Seton she useth to sit working with the needle in which she much delighteth and in devising works’. Brought up in the French court from the age of five and queen of France at the age of 16, Mary had learned the art of embroidery from her future mother-in-law, Catherine de’ Medici, who had brought professional embroiderers with her from Italy when she married

Henry II. In fact, Mary was one of the first to launch this type of needlework in England.

Her custody with the Cavendishes was not particularly strict, and she was able to correspond with a number of individuals at home and abroad and thus have access to their publications. These were the years when the first important illustrated printed works on fauna and flora were appearing on the continent. Indeed, it has been demonstrated that Mary's plant-slip embroideries are derived from the illustrated herbal of Pietro Andrea Mattioli and that several of the birds and animals that appear in the embroideries are taken from the publications of the Swiss naturalist Conrad Gessner and the French court cosmographer André Thevet. Her sources may also have included interior and exterior decorative schemes that could be seen in France, Scotland or England, such as that in Hardwick Hall. In addition, she may have had the opportunity to see some preserved exotic specimens in one of the chambers of curiosity that were becoming increasingly popular over the course of the 16th century, although England was a late starter in this field.

André Thevet had brought back to France from Brazil animal and bird skins, a bow and arrows, a headdress made of toucan feathers and other items from his ten-week stay in South America. Inventories of Mary's possessions drawn up in Scotland soon after her return from France include natural curiosities such as 'the beik of a foule of India or Brasile', along with precious stones and other items. Thevet certainly provided her with some exotic images from America: the opossum-looking creature called the *su*, a toucan and another bird, labelled as 'A BYRDE AMERICA' (perhaps to be identified with the blond-crested woodpecker that is today found in the Chaco region between Argentina and Amazonia), which is adjacent to the 'TATOU' on the Cavendish Hanging.

However, neither Conrad Gessner nor André Thevet was Mary's source in the case of the armadillo. Thevet described the armadillo, but he failed to provide an illustration. Gessner did include a woodcut of a '*tatou*' in two of his publications, but differences in posture indicate that this is not the source of Mary's armadillo either.

In this case – as not infrequently happens – we find the first known printed image of an armadillo in a work that has nothing to do with the Americas. The French naturalist Pierre Belon du Mans had developed a passion for the study of the world of nature while growing up in Brittany. He went on to study botany and medicine and travelled widely to Venice, Turkey, Egypt, Syria, Anatolia and Constantinople between 1546 and 1549. These and his other travels back and forth across Europe suggest that he was acting as an undercover agent as well, though whether his murder in the Bois de Boulogne in 1565 was due to these activities, to his outspoken condemnation of the Protestants or simply to being in the wrong place at the wrong time remains a mystery. He published several works on his travels and on natural history in the 1550s.

In one of these, with the wide-ranging title *Observations of Several Singularities and Memorable Things Found in Greece, Turkey, Judea, Egypt, Arabia and Other Foreign Countries*, first published in Paris in 1553, Belon calls the armadillo a little creature from Brazil, unknown in antiquity, which is a kind of hedgehog, apparently mistaking the bristles on its shell for spikes.[1] It was not in America (which he never visited) but in the Turkish market in Constantinople that Belon saw an armadillo. By this time armadillos were no longer so rare in Europe. An Italian traveller from Florence, Galeotto Cei, noted the presence of dried Brazilian armadillos in Rouen at roughly the same time, and Belon himself claimed to have seen them living on grain and fruit in France. The woodcut illustration contained in the final chapter of his book on the voyage to the Levant shows the armadillo as represented by Mary in her embroidery. Although it is facing in the opposite direction, its posture – and the evidence of other borrowings from Belon by Mary such as her images of a monkfish ('SEA MOONKE') and of an ape-like creature with female breasts and a long penis ('AN APE OF TURKY') – make it most likely that Belon's image is the model for her embroidery.

[1] P. Belon, *Observations of Several Singularities and Memorable Things Found in Greece, Turkey, Judea, Egypt, Arabia and Other Foreign Countries* (Paris, 1553), 210^{r}.

Belon notes that the armadillo's scaly armour was already common in many collections of curiosities because it is easy to preserve and transport over long distances. However, when an illustrator did not have access to an actual specimen and had to depend on a textual description alone, things could go very wrong. For example, the words used by Sir Walter Raleigh to describe the armadillo as being 'barred over with small plates somewhat like to a Kenocero'[2] might explain why we find a rhinoceros on a German plaquette showing a personification of America – perhaps the artist assumed that this was what an American armadillo looked like.

Nevertheless, it is in a work on America first published in the Ottoman Empire as late as 1730 that we find one of the most curious descriptions and representations of an armadillo. According to the author of this remarkably out-of-date *History of the India of the West*, which draws on Italian translations of four early writers on America:

> There is also an animal named 'armadillo' that resembles in shape a horse with a pack saddle. It is like a beast of burden . . . On its back it has a natural pack-saddle from under which its feet and tail protrude. It is the size of a dog.[3]

The bizarre attempts to represent the armadillo in the various manuscripts and printed editions of this work indicate just how a lack of familiarity with the creature in question could lead the illustrator astray.

So, the choice by Mary, Queen of Scots, at one time queen of France, to carry out her needlework in Derbyshire, Yorkshire and Staffordshire using an image of an American armadillo seen in the market in Constantinople by a French naturalist was, after all, an astute one.

[2] W. Raleigh, *The Discoverie of the Large, Rich and Bewtiful Empyre of Guiana* (London, 1596), 61.
[3] T.D. Goodrich, *The Ottoman Turks and the New World: A Study of* Tarih-i Hindi-i Garbi *and Sixteenth-Century Ottoman Americana* (Wiesbaden: Otto Harrassowitz, 1990), 305.

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MEXICAN PORTRAIT

Andrés Gutiérrez Usillos

Figure 1. Portrait of Lady María Luisa de Toledo and anonymous native companion. Attributed to Antonio Rodríguez Beltrán, Viceroyalty of New Spain, c.*1670. Oil on canvas, 209 × 128 cm (courtesy of Museo de América (MAM 2016.06.01), on loan from the Museo Nacional del Prado; photo by J. Otero).*

Recently recovered from the storerooms of the Prado Museum and exhibited at the Museum of America in Madrid, this intriguing baroque portrait reflects, on the one hand, the courtesan intimacy of two women, the one a noble Hispanic *infanta* who has just come of age as a lady, and the other a native Chichimec *enana* or dwarf from the northern frontier region of New Spain. At the same time, the physical attributes of the two women distance them by means of a series of codes that announce their identities and likely biographies. The disquieting gazes and finer details of the painting further awaken the curiosity of the spectator, inviting her to intuit the messages it guards.

Behind this painting lies a fascinating story linked not only to the biography of the primary protagonist, recently identified as Lady María Luisa de Toledo y Carreto, marquis of Melgar de Fernamental, but also to that of the *enana* or native Chichimec woman, about whom much less is known. Although presented on a secondary plane, her figure nevertheless steals a good measure of the show from the marquis. We cannot turn our eyes away without asking who she was, or indeed why she was included in the lady's portrait.

Despite its fascinating features, in Madrid this portrait has attracted little or no interest until now. A childless widow, María Luisa took her portrait with her when, in the early 18th century, she entered the Convent of Constantinople in Madrid as a nun of the *velo negro y coro*, a position in which she was not responsible for domestic tasks in the convent. There she passed her last days surrounded by her memories and personal objects, among these a notable *inmaculada* painted by Francisco de Herrera el Mozo, which had presided over the altar of the principal oratory of the residence. Upon the disentailment of church property in 1835, both paintings were transferred to the collection of the Museo de la Trinidad. Once there, the portrait was not only ignored, it was catalogued as 'disposable' and probably offered for sale, as occurred with Herrera's painting and indeed many others. Years later, the museum was merged with the Museo Real de Pinturas, the forerunner of today's Prado Museum. At the Prado the painting passed once again into storeroom oblivion, where it was considered a minor work of the Spanish school. The lineage of terse titles assigned to the painting are part of this museal story of oblivion and misrecognition. When the confiscated painting came into the museum, it was described as 'a painting and portrait of a well-dressed young woman with gloves in one hand'.[1] Shortly thereafter, the painting appeared in the museum's inventory with the number 959 and the title *Portrait of a Lady in a White Embroidered Dress, with the Left Hand Resting on the Head of a Dwarf. Life-size and full-length*. When in the Prado Museum, our painting was identified with the number P3608 and described first simply as *Portrait of a Lady* and finally as *Portrait of Infanta with Dwarf*.

The unhelpful titles or descriptions obviously did not foreworn us of what we would find when we examined the painting. It was precisely the tattooed native woman, described simply as a 'dwarf' in the Prado's latest inventory, that sparked our interest. The link to the Convent of Constantinople in Madrid allowed us to identify the anonymous lady in the picture as Lady María Luisa de Toledo. We were unable to ascertain the name or condition (servant or slave) of the native woman represented in the picture, however, and as a result we do not doubt that the title we have given the painting may be modified in the future: *Portrait of Lady María Luisa de Toledo with Her Native Companion* (*Retrato de Dª María Luisa de Toledo con su acompañante indígena*). Recovering to the extent possible its context and history, our research has led us to reconsider the painting as a rare example of feminine portraiture in 17th-century Mexico.

Lady María Luisa de Toledo was the only daughter of the marquis of Mancera, Don Antonio Sebastián de Toledo, and Doña Leonor Carreto. She was born in Madrid on 13 September 1656. Before reaching the age of eight she moved with her parents to Mexico City. Her father had just been named viceroy and captain-general of New Spain (1664–73). The portrait, which was made around 1670, and thus when she was at the age of 14 or 15, appears to have been painted precisely to announce her new status as a lady. During this period the concept of adolescence did not exist, and as a result one passed abruptly from childhood to adult status. When she symbolically left behind her 'infancy', negotiations immediately began to find a suitable spouse. Her wedding by proxy with Don Joseph de Silva, the third son of the duke of Pastrana e Infantado, took place in the Mexico City Cathedral in 1673, when the viceroy's daughter was only 16. At the time, marriage was the destiny of most elite Hispanic women. The only alternative was to become a nun in a convent. This was the path followed, for example, by Juana de Asbaje, better known as Sor Juana Inés de la Cruz, the great poet and polymath of the Mexican baroque (Figure 2). Juana had been summoned to join the viceregal court of Leonor de Carreto as a *menina*. Rather than contract matrimony she entered a convent so that she might continue to dedicate herself fully to intellectual pursuits.

It is quite probable that this double portrait is related to a crucial moment in the life of the lady, that is, her ritual passage to maturity. It is the moment of her presentation to society as a marriageable young woman and, as such, the painting is made with the intention of making visible her qualities as a woman. Perhaps for this reason she is presented adorned only with pearls, symbols of purity, virginity and fecundity. In this regard, the native woman companion is the scenic counterpoint that serves to highlight the lady's qualities: her beauty and the whiteness of her skin, which denote Spanish origins, contrasted with the tattooed face and proportions of the native woman; or her slim waist and height, accentuated by posing alongside her dwarf companion. On the other hand, it is evident that the sumptuous dress, swollen with heavy fabrics and opulent lace, deforms the true anatomy of

[1] J. Gálvez et al., *Libro de inventario del Museo de la Trinidad* (1856), registro no. 959.

Figure 2. Sor Juana Inés de la Cruz, *Andrés de Islas, Viceroyalty of New Spain, 1772. Oil on canvas, 105 × 84 cm (courtesy of Museo de América, MAM 00022; photo by J. Otero).*

the young woman. It takes some effort to divine where the silhouette of her arms is lost in the bombastic sleeves, or what the true proportions are of her body, which is undoubtedly extended by *chapines* – those high platform shoes that hid the feet from indiscreet glances and raised the status of the lady.

How shall we interpret the gesture of María Luisa, resting her hand on the head of her dwarf companion? Possibly, it could form part of the exhibition of virtues of the young woman as a future spouse. Her firm hand and delicate gesture suggest both dominance and tenderness, control and sweetness, simultaneous qualities desired in the care of children and the treatment of servants. And what of the glove? What is the meaning of the strange manner by which it is held? Its use is fundamentally symbolic, a highlight of the condition of the lady. These very fine gloves, most likely of frangipane or amber, cling to the hand like a second skin. The gloved extremity may be distinguished from the glove only by the difference of colouration between the two. The delicate manner by which, with only the middle finger, she suspends the glove she has taken off her left hand is clearly significant. It is possible that this gesture also transmits those desired qualities in a young woman linked to equilibrium, affection, love and goodness, all traits precisely associated with the middle finger, the central axis of the hand.

The other element of the portrait is the native Chichimec woman who accompanies the Lady María Luisa de Toledo. As we have noted, she appears to play a notable roll in the pictorial scene as contrast for the lady. But the presence of a tattooed native woman dwarf and the perceptible complicity that the two women share also incarnates the power and prestige of the family, its relations with America, its calm dominion over an exotic world. The marks on her face exhibit her ethnic origin, while her costume signals the courtly context of acculturation into which she had been inserted. Born among some Chichimec group in the northern region of New Spain, possibly Nuevo León, this woman was likely captured as a slave in one of the frequent raids by soldiers and then handed over 'in deposit' to a likely patron, a not infrequent variety of temporary slavery before obligatory acculturation as a servant. In this intermediate station before arriving at the court of the viceroy, she would have learned to wear and indeed weave the *huipil* or embroidered blouse and to adopt the language, religion and customs of her patrons. We do not yet know the details of how she came to be in deposit as part of the 'family' of the viceroy, but it is likely that she is the same Chichimec woman that Doña Leonor de Carreto describes at the Convent of San Jerónimo in Mexico City, where Sor Juana Inés de la Cruz professed.

It was surely the body of this Chichimec woman that precipitated her entrance into the viceroy's court. As in many other aspects of fashion, the viceroy's court followed the Madrid court's fancy for *sabandijas* or diminutive companions endowed with unusual physiognomies. The painting suggests that this Chichimec woman suffered from achondroplasia, a congenital disease that provokes the shortening of the limbs and pronounced macrocephaly. Similar traits may be found in other portraits of the period, for example the case of Mari Bárbola in the celebrated *Las Meninas* or Sebastián de Morra in *El bufón el Primo*, both by Philip IV's court painter

Diego Velázquez and both on permanent exhibit in the Prado. Selected precisely for their bodies, these persons performed symbolic roles as 'deforming mirrors' (*espejos deformantes*) that reinforced the qualities of the nobles, princes and kings with whom they cohabited. Some of these persons could become confidants and advisors, particularly for children. On occasion, they were portrayed together with the *infantas* they served, as in the case of Velázquez's *Las Meninas* or *La Infanta Isabel Clara Eugenia y Magdalena Ruiz* by Alonso Sánchez Coello, where the daughter of Philip II extends her hand over the head of her companion in much the same gesture observed in our portrait of the Lady María Luisa de Toledo.

The painter, who may have been Antonio Rodríguez Beltrán, has represented in rather realistic fashion the features of the woman's face, forehead and prominent mandible, the characteristically depressed nasal bridge and even the precise form of the 'trident sign' or separation of the middle and ring fingers, one of the symptoms of achondroplasia.

The portrait was among the personal possessions that accompanied our lady until her death in 1707 in the Convent of Constantinople in Madrid. Her trousseau included hundreds of objects from the two Indies, East and West. Objects from the East Indies or Asia, shipped by the Manila galleon to New Spain or Mexico, included porcelains, Japanese and Chinese furniture and folding panels, silk and cotton fabrics, and lacquers. From the West Indies or Americas, her collection included furniture from Oaxaca; ceramics from Guadalajara, Panama and Chile; silverwork from Cuba and Nicaragua; and of course paintings made in Mexico. It is, then, thanks to our lady's cloistered collection, for centuries mishandled and neglected by Madrid's art museums, that we now know something about this rare portrait.

Figure 3. Detail with 'trident sign' or separation of the middle and ring fingers.

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CLAY VESSELS

Jorge Cañizares-Esguerra

Figure 1. Tonalá búcaro, c.*1675 (Metropolitan Museum of Art, New York. Sansbury-Mills Fund, 2015; public domain).*

The *búcaros* or vases of Estremoz (Portugal), Nata (Panama), Chile and Tonalá (Guadalajara, Mexico) were earthenware made of clays with extraordinary powers. Búcaros allowed water inside to evaporate easily while creating a wonderful aroma in the atmosphere. The remaining water in the jug would become refreshingly cold, partaking of the aroma of the special clays. Búcaros were perfumed humidifiers and systems of water refrigeration. In early modern Portugal, grandees and fashionable urbanites would eat clay (allegedly from Armenia but actually from Estremoz) as pastries wrapped with the seal *Sultan*. Sultan pastries were morsels that resembled rosary beads. The pastry was made of clay mixed with flour, sugar, cinnamon, cloves, nutmeg, bergamot oil (extract from the rind of oranges), vanilla, amber and musk. This was the early modern contraceptive pill for the rich and pale. Physicians encouraged patients to eat clay. When ingested baked, it was capable of lowering blood iron levels, causing paleness and stopping menstruation. Brothels had prostitutes ingest Tonalá and Estremoz clay for birth control. The Tonalá búcaros of Guadalajara were even better than those of Estremoz for avoiding pregnancy. It is very likely that the production of búcaros was first introduced by Franciscan friars who arrived in the town of Tonalá in the wake of Nuño de Guzmán's conquest of Nueva Galicia in 1530. Tonalá was the political indigenous centre of the region and the first capital of Nuño de Guzmán's new kingdom. It was also a pre-Hispanic centre of pottery production.

In Diego Velázquez's famous palace portrait of the royal family of King Philip IV, today known as *Las Meninas*, the *menina* María Agustina Sarmiento offers the *infanta* Margarita a Tonalá búcaro (Figure 3).

Figure 2. The curato *of Tonalá and subordinate towns, 1772, produced by the* alcalde *or mayor Agapito Martínez. The map became part of general report on curatos or parishes of the dioceses of Nueva Galicia submitted to the Council of the Indies by the president of the Audiencia of Guadalajara, Eusebio Sánchez (Archivo General de Indias, Mapas-Mexico, 285; public domain).*

Figure 3. Diego Velázquez, detail of Las Meninas *(Prado Museum; public domain).*

Paleness and amenorrhea were ideal images of female purity in the baroque. The infanta was still a girl. Should we assume the menina wanted the royal heir to drink aromatic water or to avoid future menstrual discharge, or perhaps both?

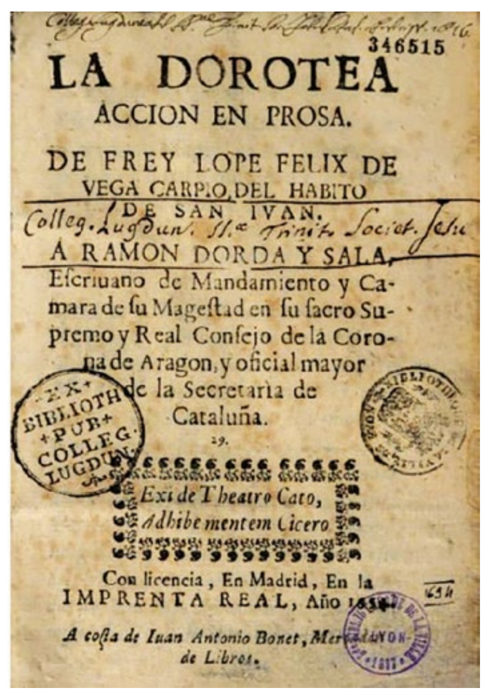
The reasons why the duchess of Béjar, on the other hand, grabbed a búcaro of Estremoz from her dwarf-page – as the 1585 painting by Sánchez Coello suggests – are less clear (Figure 4).

The trade of clays from Estremoz and Tonalá surfaces in the literature of the golden age. In *El acero de Madrid,* a *comedia* published in Madrid in 1611 (and one assumes staged in theatres prior to its publication), Lope de Vega recounts a series of wooing couples, particularly Belisa and Lisardo. Belisa is beautifully pale and anaemic (*opilada*) because she likes to chew Portuguese clay.

In 1634, Lope de Vega has Dorothea as another aspiring pale female who is wooed by the poet Fernando and the much older Bela. The Mexican Bela is no match for the dreamy Fernando, Dorothea's true love. But Bela has money, and búcaros. Bela eventually dies of his wounds from a fight with Fernando, but he leaves Dorothea the expensive búcaros as a token of his affection (Figure 5).

Tonalá, Nata, Chilean and Estremoz búcaros signified early modern wealth in Spain and Portugal and among Iberian elites resident in Italy and Flanders

Figure 4. Alonso Sánchez Coello, Doña Juana de Mendoza, duquesa de Béjar, con un enano, *(Madrid, 1585; Marqués de Griñon Collection; public domain).*



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LA DOROTEA

ACCION EN PROSA.

DE FREY LOPE FELIX DE VEGA CARPIO, DEL HABITO DE SAN IVAN.

Colleg. Lugdun. SS.ae Trinit. Societ. Jesu

A RAMON DORDA Y SALA, Escriuano de Mandamiento y Camara de su Magestad en su sacro Supremo y Real Consejo de la Corona de Aragon, y oficial mayor de la Secretaria de Cataluña.

EX BIBLIOTH PUR COLLEG LUGDUN

Exi de Theatro Cato, Adhibe mentem Cicero

Con licencia, En Madrid, En la IMPRENTA REAL, Año 1634.

A costa de Iuan Antonio Bonet, Mercader de Libros.

Figure 5. Lope Felix de Vega Carpio, La Dorothea *(Madrid, 1634; public domain).*

(although one of the largest extant collections of the pots resides today in London at the Victoria and Albert Museum). Búcaros surfaced repeatedly in early modern still-life paintings as representations of grandee splendour and the aristocratic life of collecting. They also surface in probate records of aristocratic collectors. In eight late 17th-century letters addressed to several members of the Italian nobility, Count Lorenzo Magalotti articulated criteria for collectors. He offered observational and sensory techniques on how to identify the regional varieties of búcaros and how to distinguish American from Portuguese ones (Figure 6).


DELLE
LETTERE FAMILIARI
DEL CONTE
LORENZO MAGALOTTI
E DI ALTRI INSIGNI UOMINI
A LUI SCRITTE
VOLUME SECONDO.

IN FIRENZE L' ANNO MDCCLXIX.
NELLA STAMPERIA DI S. A. R. PER GAET. CAMBIAGI.
CON LICENZA DE' SUPERIORI.

Figure 6. Lorenzo Magalotti, Delle lettere familiari, *2 vols. (Florence, 1769; public domain).*

Figure 7. Giuseppe Recco, Bodegón con sirviente, *1679. The painting depicts a Seville collection of New World búcaros along with an African house slave (Fundación Casa Ducal Medinaceli; public domain).*

Although many Mediterranean nobles collected búcaros of Estremoz avidly, the countess of Ocaña was one of the most important early modern collectors of búcaros of Tonalá, as the records of her estate show. Her collection reached into the thousands of items. Her descendant Josefa de la Cerda y Palafox, widow of the count of Ocaña, left the National Archaeological Museum of Madrid a collection of only 100 búcaros of Tonalá in 1885. In 1941, the museum ceded the Tonalá búcaro collection to the Museum of the Americas, where they can still be found.

In short, the early modern pill of the nobility was made of clay from Portugal and Mexico. The guardians of their supplies were, in many cases, countesses. Today these early modern pills are stored in exotic ethnography museums.

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SINGING VIOLIN

Jorge Cañizares-Esguerra

Figure 1. Francisco Solano, 'Sun of Peru', as violinist. Pedro Rodríguez Guillén, Sol y año feliz del Perú San Francisco Solano, apostol y patron universal de dicho reyno *(Madrid, 1735; public domain).*

When Francisco Solano died at the Franciscan convent in Lima, flocks of birds surrounded his body. Music filled the halls of the cloister. Solano's most distinguished hagiographer, the Peruvian Creole Diego de Cordova Salinas, concluded in 1643 that Solano, who had converted Indians in Paraguay with his violin, was a walking tree of paradise, on which birds perched to sing. Solano was music.

Pouring over hundreds of notarised witness accounts, Cordova Salinas reconstructed the peregrinating life of Solano, from his birthplace in 1549 in Montilla (Andalusia) to this deathbed in 1610 in Lima. Solano was a new Francis and Lima a new Assisi.

Cordoba described in detail Solano's many miracles, from curing the ulcerous wounds of children and lepers in Andalusia with his tongue to his mastery over animals in the New World. Solano's control over crabs had saved the lives of both slaves and masters.

The manner of Solano's arrival in Peru was miraculous. He made the passage in 1589 on a ship with a cargo of slaves coming from Cartagena via Panama. Shipwrecked off the coast of the Colombian island of Gorgona, to the south of Buenaventura, the crew and the Spaniards on board scrambled onto the beach, but Solano stayed behind with the slaves. By dint of his preternatural control of the waters, Francisco held the broken hull from sinking for three whole days, until the slaves were finally rescued by

Figure 2. Francis of Lima and Assisi. Lima as Rome. Pedro de Alva y Astorga, Naturæ prodigium gratiæ portentum: hoc est Seraphici P. N. Francisci vitæ acta ad Christi D. N. *(Madrid, 1651; public domain).*

Figure 3. Solano, Peruvian apostle of Indians and Africans. Detail of frontispiece, Alonso Briceño. Prima pars celebriorum controuersiarum in primum sententiarum Ioannis Scoti *(Madrid, 1642; public domain).*

Figure 4. Solano, the Peruvian St Francis, turns a rampaging, murderous bull into a pet. Anonymous, Francisco Solano *(1652, Museo de Santa Clara, Bogotá; public domain).*

the survivors. When a passing ship finally picked them up from the island three months later, Solano had fed the survivors with hundreds of willing crabs, who daily crawled into his cowl.

Upon arrival in the Viceroyalty of Peru, Solano was sent to the Andean village of Tucumán in what is today Argentina, where his miraculous deeds continued. Birds would follow him. A bull that had killed two Indians in the bullring before breaking loose encountered Solano at the town plaza and became his pet.

Solano devoted much of his time in Tucumán singing to the natives of nearby Paraguay. By infused knowledge, he immediately learned many indigenous languages and preached to the natives in their tongues. The day an army of 6,000 Indians surrounded Tucumán, he pacified a bull; the Indians put down their arms and surrendered to the power of Christ. Solano returned from Tucumán and Paraguay to Lima, walking with cilices on his body and nails on his soles. He headed north to Trujillo in Peru to tend the emerging communities of slaves and Indians who laboured in the sugar mills of the Pacific coast. Circa 1600 he accurately predicted the devastating earthquake that was to wipe out the city of Trujillo in 1619.

But it was in the Nineveh that was Lima where he performed most of his salvific work. Solano was a preacher who did not just pacify birds, bulls, African slaves and Paraguayan Indians. He also had the ability to terrify Spanish, Portuguese and Creole townsmen or *vecinos*. Solano was the Savonarola of Lima. He would walk for days on the streets of the city, denouncing the rising phenomenon of concubinage. His campaigns netted the church dozens of converted, terrified mixed-race couples living in sin, who now willingly took their sacramental vows of holy matrimony. In his decade of walking about Lima he became known as a prophet, a patriarch, a virgin and a martyr. He would levitate while in trance. He would cure fatally wounded birds and dying children.

When he died, his musky, flowery-scented, uncorrupted body was buried under the altar of the Franciscan church, which within a week became a shrine. When Cordova Salinas described the shrine as one of the jewels of the new Assisi that was Lima, he gave an account of what appears to have been the greatest sacred curing spot and apothecary of South America. The shrine was crowded with discarded crutches and bandages and replicas of copper heads,

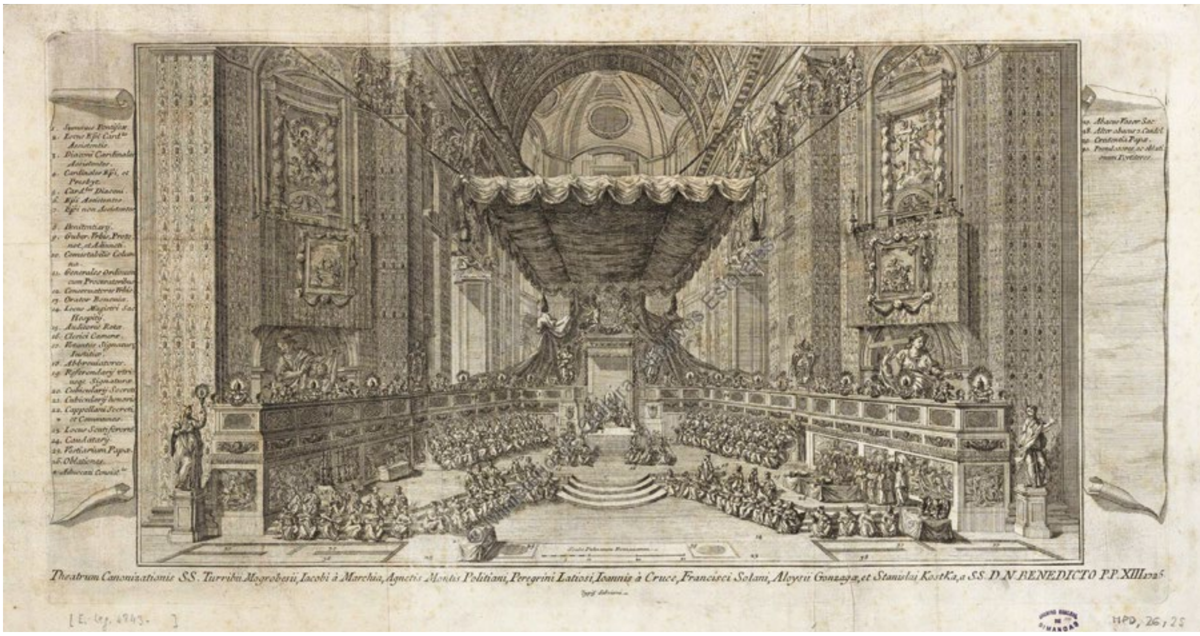

Figure 5. Solano and the canonisation in Rome of eight saints (1726). Jacobi a Marchi, Theatraum canonizationis Francisci Solani *(Archivo de Simancas, MPD 26, 25; public domain).*

legs and arms. It was a holy sanctuary of healing for the peregrinating ill. They came from as far away as Trujillo, Tucumán, Paraguay, Santiago de Chile, Málaga and Córdoba. There were crowds in the shrine, fighting over samples of the ground of his burial and the oil of the seven lamps that burnt perpetually in his tomb.

Peruvian Franciscans mounted a campaign to canonise Solano in Rome as a new American St Francis Assisi. They succeeded. In 1675, he was beatified. In 1726 he was canonised, along with the first Tridentine bishop of Peru, Toribio de Mogrovejo, and the Flemish Franciscan Jacob of March (the two young Jesuits Gonzaga and Kostka were also canonised at this time).

In 1728, the Franciscans of Flanders had an altar built for March and Solano (Figure 6). The Franciscans also procured a supply of Solano's relics, used to cure the peregrinating ill.

In 1728, the Franciscans of Cologne had a treatise written on the lives of March and Solano as the fulfilment of the Old Testament's Joshua and Caleb.[1] Joshua and Caleb were the only two of the 12 Israelite spies who did not flinch when it came to invading Canaan, the only two who would survive Exodus to see the Promised Land.[2]

If St Francis was as a second Christ in medieval Christendom, Solano became a second St Francis in early modern Peru. Solano's ability to sing to birds transformed him into a musical symbol of conversion through sweet persuasion. If Solano was capable of attracting and taming birds and bulls, he was equally capable of converting Indians and African slaves. Upon his death, this walking Peruvian violin became a sacred apothecary. The curative power of his relics attracted to his chapel-pharmacy in Lima hundreds of limping ill who consumed his body and its aura as sacred *materia medica*. The fame of the curative power of his bones spread across the ocean. Solano's fame was Lima's fortune. If Francisco Solano was a new

[1] *Zwey Neu-Testamentische Josue und Caleb: d.i. Lobrede von Jacob de Marchia u. Franciscus Solanus* (Cologne, 1728).
[2] Num. 13.

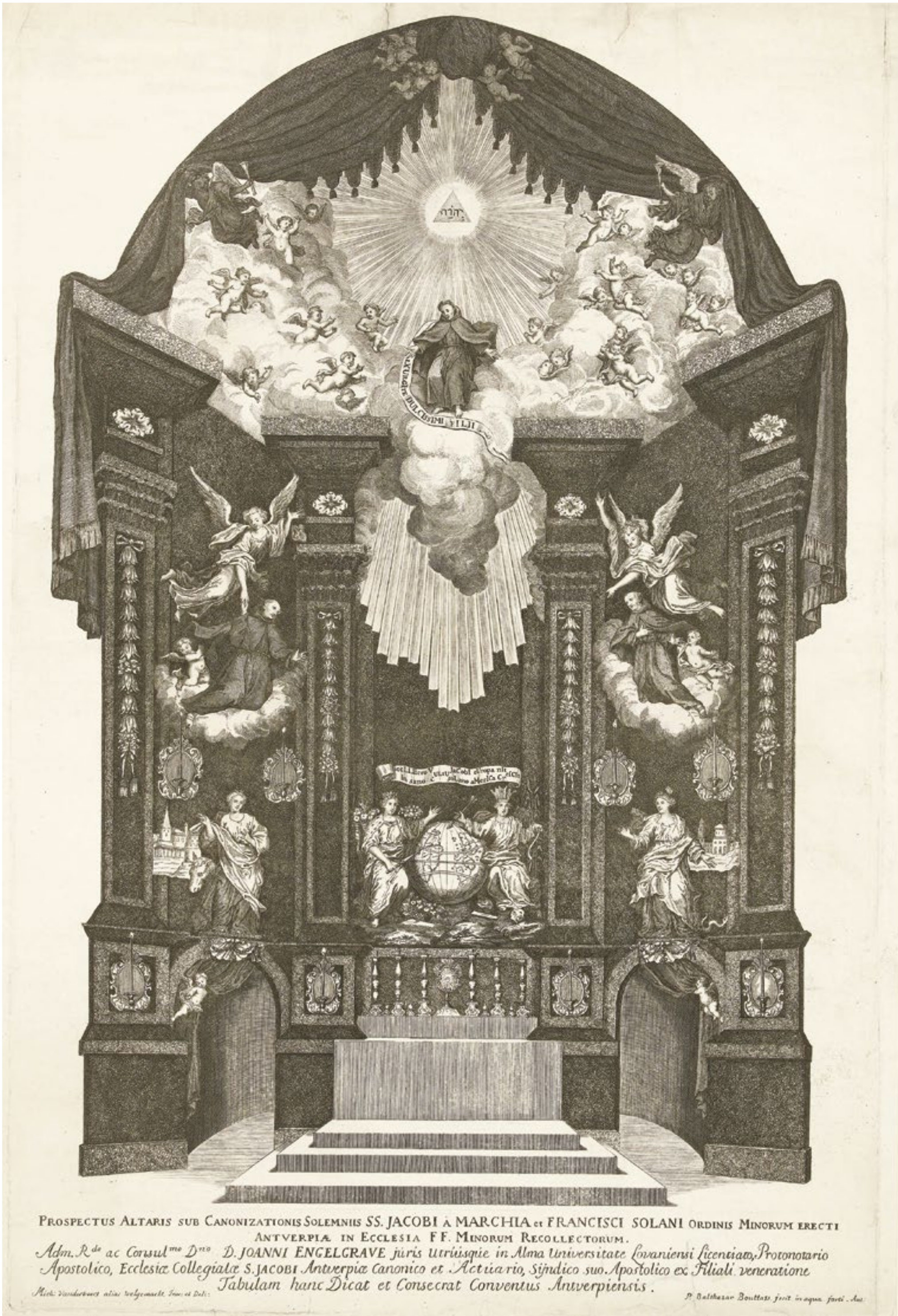

Figure 6. Solano and March on their Flemish altar (1728). Pieter Balthazar Bouttats and Michiel van der Voort, Prospectus Altaris sub Canonizationis Solemniis SS Jacobi à Marchia et Francisci Solani Ordinis Minorum Erecti Antverpiae in Ecclesia FF Minorum Recollectorum *(Rijksmuseum, Amsterdam, RP-P-OB-82.786; public domain).*

St Francis, then Lima, the city of the kings of Peru, was a new Rome. Francisco's Peruvian fame earned him beatification first and then canonisation in Rome. Holy relics of the singing violin of Peru who attracted birds, Indians and slaves moved to altars in Flanders and Cologne, where they can still be found today.

Dritte Predig.
Die
Zwey Neu-Testamentische
JOSUE und CALEB.
Oder
Lob- und Ehren-Predig
Von denen
Zwey Heilig-gesprochnen Glorwürdigen
Beichtigern
JACOBO DE MARCHIA
Und
FRANCISCO SOLANO.
Ord. S. Francisci Recollect. Regul. Observantiæ.
An Dero Hochfeyrlichen
CANONIZATION - Begängnus
Bey denen
Wohl-Ehrwürdigen P. P. Franciscanern in
Augspurg / gehalten den 22. Julij / als am Fest der Heiligen
Büsserin Magdalenä / Vormittag.
Anno 1727.
Von
A. R.D. P. Ignatio Seefelder, Can. Reg. S. Augustini ad
S. Georgium Augustæ Professo.
Augspurg / in Verlag Mathiä Wolff / Buchhändlern nächst U. L. FrauenThor. 1728.

Figure 8. Cologne treatise on March and Solano as Joshua and Caleb (public domain).

Figure 7. Extant relic of Solano in Flanders (Museum De Mindere, Sint-Truiden, Belgium, MVM/OFM/R414; public domain).

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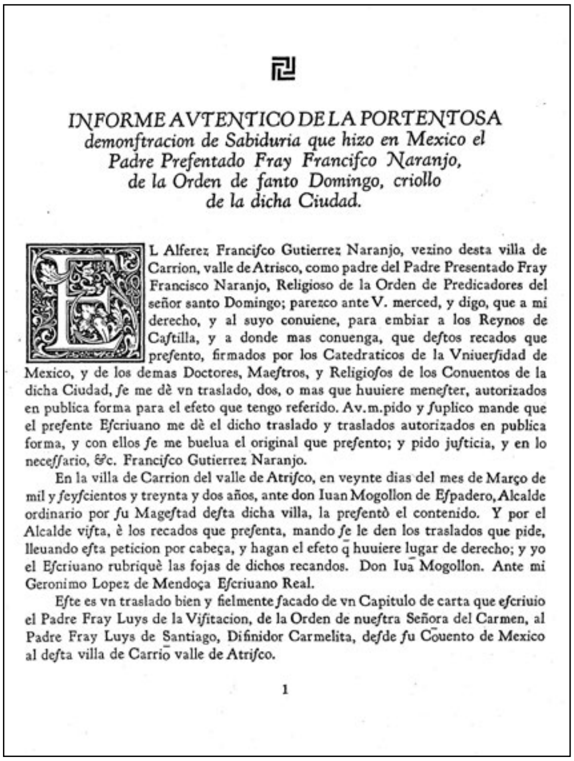
MESTIZO MEMORY PALACES

Jorge Cañizares-Esguerra

Figure 1. Mnemonic alphabet in Nahuatl, Purépecha and Otomí. Diego de Valadés, Rhetorica christiana *(Perugia, 1579).*

The greatest curiosities ever to appear in the 17th-century press of the global Hispanic Empire of the Indies were not the Canary Island 'lupine dwarfs' featured as pages in every Spanish Habsburg court. Nor were 'wandering hermaphrodites' the top attraction, although Catalina de Erauso surely captured the fancy of Seville. After running away as a nun in the 1580s to Chile, Catalina had fought as a squire in the wars of Arauco. She became a newspaper sensation in Seville at the moment Pope Urban VII granted her legal rights to act as a man when the inquisitive bishop of Huamanga (Peru) found the soldier out to be a woman. Catalina ended this life as a storied muleteer in Mexico. No, the real sensation and sweetheart of the Indies press was the Mexican Fray Francisco Gutiérrez Naranjo, whose remarkable feats of memory astounded readers in Mexico and beyond. As we shall see, these feats were based on a sophisticated *mestizo* memory palace based in part on native signs and developed in Mexico (Figure 1).



INFORME AVTENTICO DE LA PORTENTOSA
demonſtracion de Sabiduria que hizo en Mexico el Padre Preſentado Fray Franciſco Naranjo, de la Orden de ſanto Domingo, criollo de la dicha Ciudad.

EL Alferez Franciſco Gutierrez Naranjo, vezino desta villa de Carrion, valle de Atrisco, como padre del Padre Presentado Fray Francisco Naranjo, Religioso de la Orden de Predicadores del señor santo Domingo; parezco ante V. merced, y digo, que a mi derecho, y al suyo conuiene, para embiar a los Reynos de Caſtilla, y a donde mas conuenga, que deſtos recados que preſento, firmados por los Catedraticos de la Vniuerſidad de Mexico, y de los demas Doctores, Maeſtros, y Religioſos de los Conuentos de la dicha Ciudad, ſe me dè vn traslado, dos, o mas que huuiere meneſter, autorizados en publica forma para el efeto que tengo referido. Av.m.pido y ſuplico mande que el preſente Eſcriuano me dè el dicho traslado y traslados autorizados en publica forma, y con ellos ſe me buelua el original que preſento; y pido juſticia, y en lo neceſſario, &c. Franciſco Gutierrez Naranjo.

En la villa de Carrion del valle de Atriſco, en veynte dias del mes de Março de mil y ſeyſcientos y treynta y dos años, ante don Iuan Mogollon de Eſpadero, Alcalde ordinario por ſu Mageſtad deſta dicha villa, la preſentò el contenido. Y por el Alcalde viſta, è los recados que preſenta, mando ſe le den los traslados que pide, lleuando eſta peticion por cabeça, y hagan el efeto q̄ huuiere lugar de derecho; y yo el Eſcriuano rubriquè las fojas de dichos recandos. Don Iuā Mogollon. Ante mi Geronimo Lopez de Mendoça Eſcriuano Real.

Eſte es vn traslado bien y fielmente ſacado de vn Capitulo de carta que eſcriuio el Padre Fray Luys de la Viſitacion, de la Orden de nueſtra Señora del Carmen, al Padre Fray Luys de Santiago, Difinidor Carmelita, deſde ſu Cōuento de Mexico al deſta villa de Carriō valle de Atriſco.

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Figure 2. Informe auténtico de la portentosa demonstración de sabiduría que hizo en México el Padre Presentado Fray Francisco Naranjo, de la Orden de Santo Domingo, criollo de la dicha Ciudad *(Mexico City, 1632; public domain).*

His feats were so incredible to readers that large numbers of those who attended the events gave notarised testimonies confirming their validity. In 1632, Fray Gutiérrez Naranjo showed up unannounced at a contest for a vacant chair in theology at the Royal and Pontifical University of Mexico, founded in 1551. When the judging tribunal asked Gutiérrez Naranjo to elaborate on a passage of Aquinas's *Summa*, he did one better. He had the complete works of Aquinas brought to the stage and asked the tribunal to randomly pick a sentence within any paragraph. Gutiérrez Naranjo would recite the rest of the page. He repeated the trick for hours as faculty gathered around the spectacle (Figure 2). Although he did not get the job because candidates were also required to offer personal learned glosses on Aquinas, Gutiérrez Naranjo showed that he could recite not only Aquinas verbatim but also any available printed commentary on the Dominican. To the amazement of everyone, he repeated the show in a new faculty search in 1636 (Figure 3).

EN LA CIVDAD DE MEXICO, EN CINCO DE MARZO DE mil seiscientos y treinta y seis años. Ante el General Fernando de Sosa, Suares, Cavallero de la Orden de Santiago, Corregidor desta Ciudad por su Magestad, se leyó esta peticion, que presentó el contenido.

EL ALFEREZ FRANCISCO GVTIERREZ NAranjo, vezino de esta Ciudad de Mexico, como Padre del P. Maestro Fr. Francisco Naranjo, Religioso del Orden de Predicadores del señor santo Domingo, paresco ante Vmd. y digo. Que á mi derecho, y al suyo conviene para embiar á los Reynos de Castilla, y á donde mas me convenga, que de estos recaudos, de que hago demonstracion, firmados de los Cathedráticos, Maestros, y Doctores de todas facultades desta Real Vniversidad, y Religiosos de los Conventos, se me dé vn traslado, dos, ó mas, que huviere menester authorizados en publica forma, para el effecto que tengo referido.

Otro si, se me dé otro traslado dos, ó mas del testimonio, que presento del dicho mi hijo, en razon de aver servido al Rey N. Señor en plaza de Soldado á su costa, y mencion en el Fuerte, y fuerzas de S. Juan de Ulúa desta Nueva-España.

A Vmd. pido, y suplico mande, que el presente Escrivano, ú otro Real me dé los dichos traslados de todo lo pedido, authorizados en publica forma, que hagan fé, y con ellos se me buelva el original, y originales que presento, pido justicia, y en lo necessario, &c.

Francisco Gutierrez Naranjo.

El Señor Corregidor mandó, que qualquier Escrivano Real dé al dicho Alferez Francisco Gutierrez Naranjo los traslados que pidiere de los recaudos que muestra authorizados, y como hagan fé, y hagan la que huviere lugar de derecho, y se le buelvan dichos originales, Fernando de Sosa, Joseph de la Cruz, Escrivano Publico; en cumplimiento de lo qual: Yo Diego de Reyna Guzman, Escrivano del Rey N. S. y su Notario publico de las Yndias, de los recaudos, que el pedimiento refiere sacaré vn traslado en esta forma.

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Figure 3. Report of Francisco Gutiérrez Naranjo, resident of Mexico City, on testimonies *(Mexico, 1636; public domain).*

The secret of Gutiérrez Naranjo lay in his ability to traverse the cities and palaces of memory he had learned in treatises of *ars memoriae* that had long been circulating in Tenochtitlan. The first treatise on city-palaces of memory written by a Mexican was Diego de Valadés' *Rhetorica christiana*, printed in Perugia in 1579 (Figure 4). Valadés was typical of his age: the mestizo son of a Spanish conquistador and a Tlaxcalan noblewoman. He entered the Franciscan order in Mexico and then moved to Rome, where he became a powerful member of the curia and a friend of Pope Gregory XIII, to whom he dedicated his *Rhetorica*. Although Valadés lifted his mnemonics of cities and palaces of memory from Joannes Romberch's *Congestorius artificisiose memoriae* (1533)[1] without attributions, he did introduce readers to striking novelties.

Rhetorica christiana included a detailed account of the techniques and images used by Franciscan friars in Mexico to convert and catechise natives, including

[1] Romberch, J. H. V., Sessa, M. & Crawford, W. H. (1533) Congestorium Artificiose Memorie. (Venice: Melchiorem Sessam).

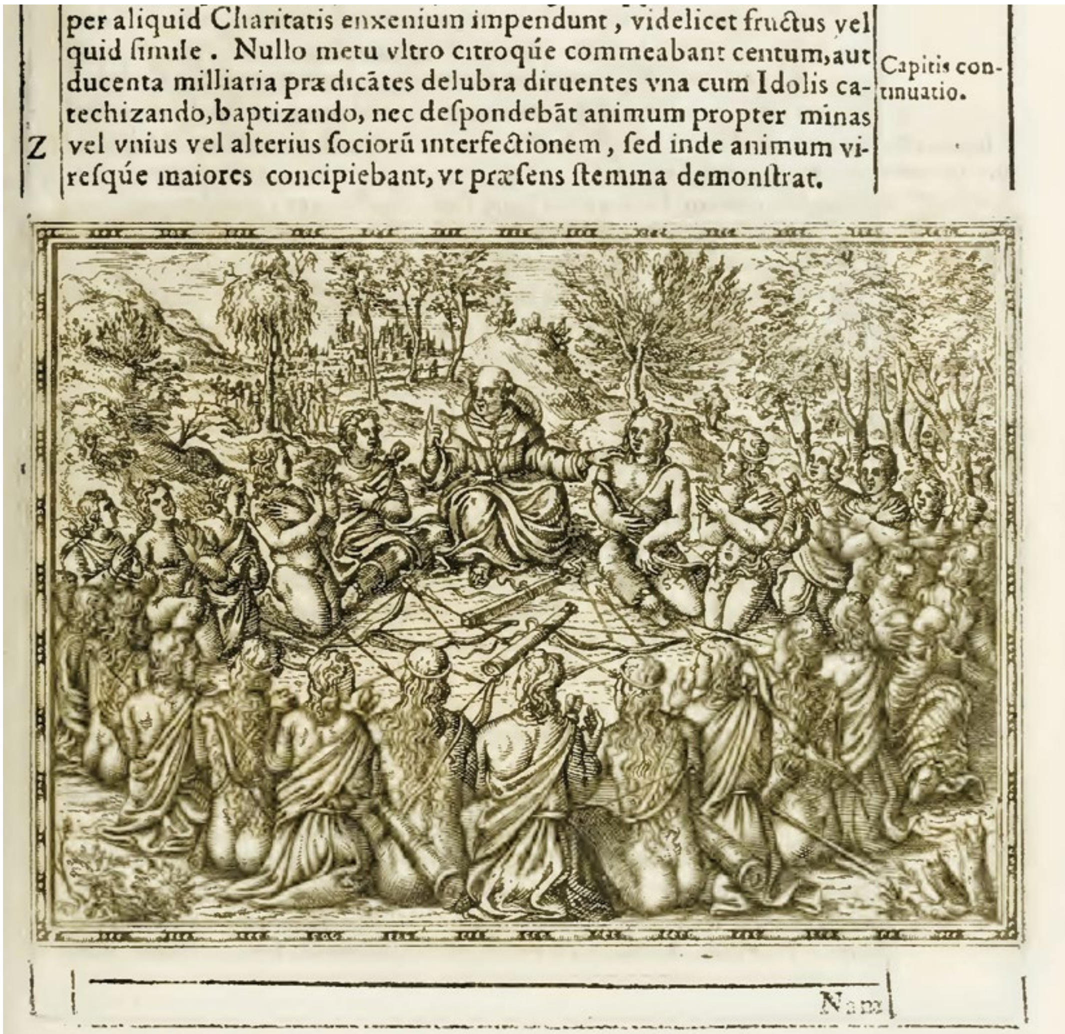

Figure 4. A Franciscan among the Chichimecas. Valadés, Rhetorica christiana.

not only Nahuas but also Chichimecas, Otomís and Tarascans. Valadés offered countless illustrations devised by Flemish friars like Peter of Ghent and Juan Focher to secure the conversion of both Nahua elites in central Mexico and stateless Chichimec polities in the northern frontiers.

Valades appended to Renaissance memory palaces mnemonic alphabets in the Tarascan, Otomi and Nahuatl languages. (Figure 1). Valadés also included illustrations of Aztec calendrical wheels of 52-year, 20-month cycles that he argued worked as mnemonic aids (Figure 5).

Finally, he included an image of Tenochtitlan as a mnemonic device of all the sacred objects in the Aztec urban landscape (Figure 6). The plate included not only the Templo Mayor or central pyramid of Tenochtitlan but also waterworks (fountains, dikes, aqueducts, pisciculture) and *materia medica* (cocoa, dragon's blood, guava, balsam, maguey, tuna, acacia and ahuehuete).

Franciscans thus mustered Aztec mnemonic technologies for purposes of conversion and invented catechisms based on the rebus-like nature of Nahuatl logograms. Named after their Flemish-friar inventor, Jacob of Tester, Testerian catechisms that deployed

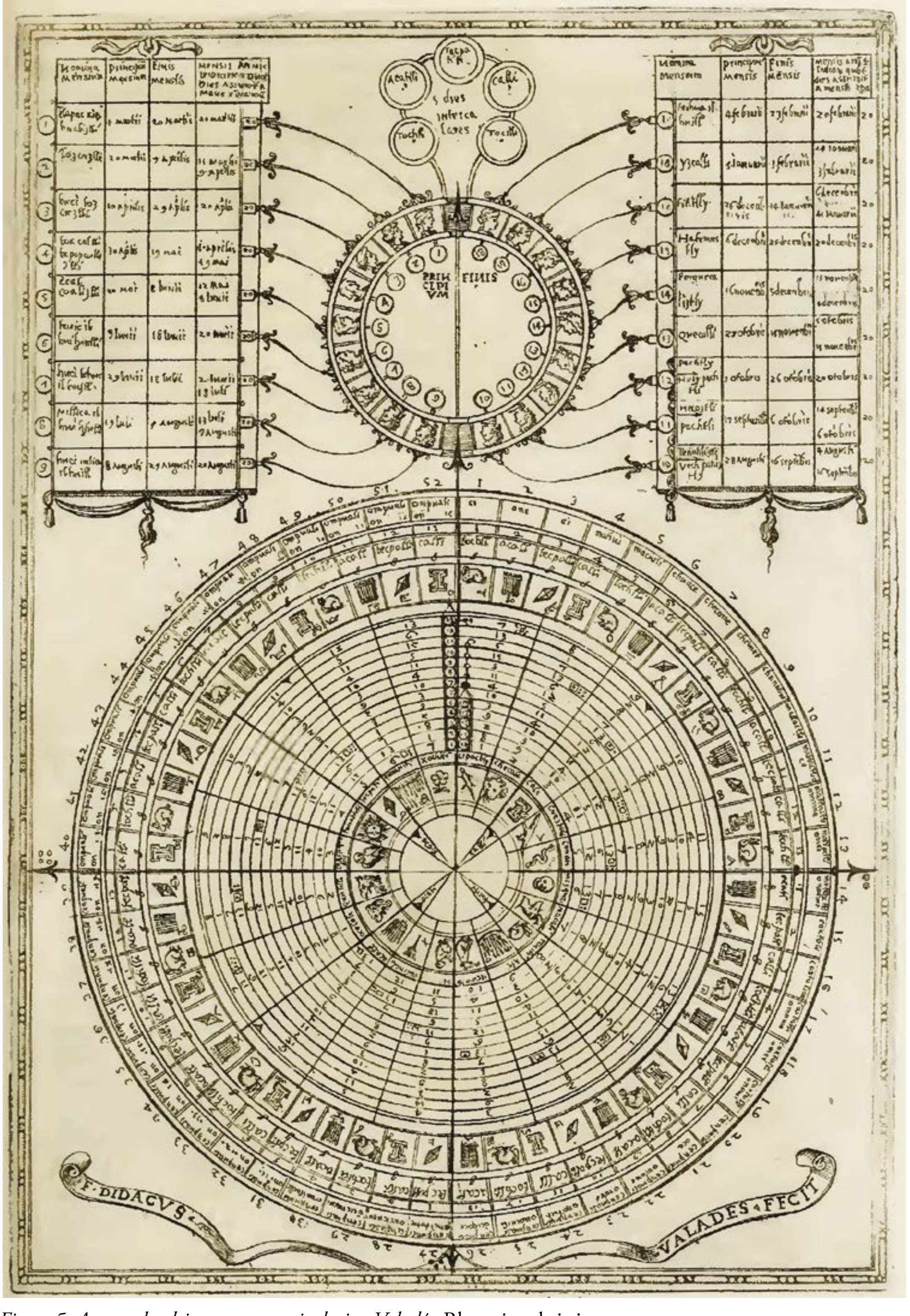

Figure 5. Aztec calendrics as mnemonic device. Valadés, Rhetorica christiana.

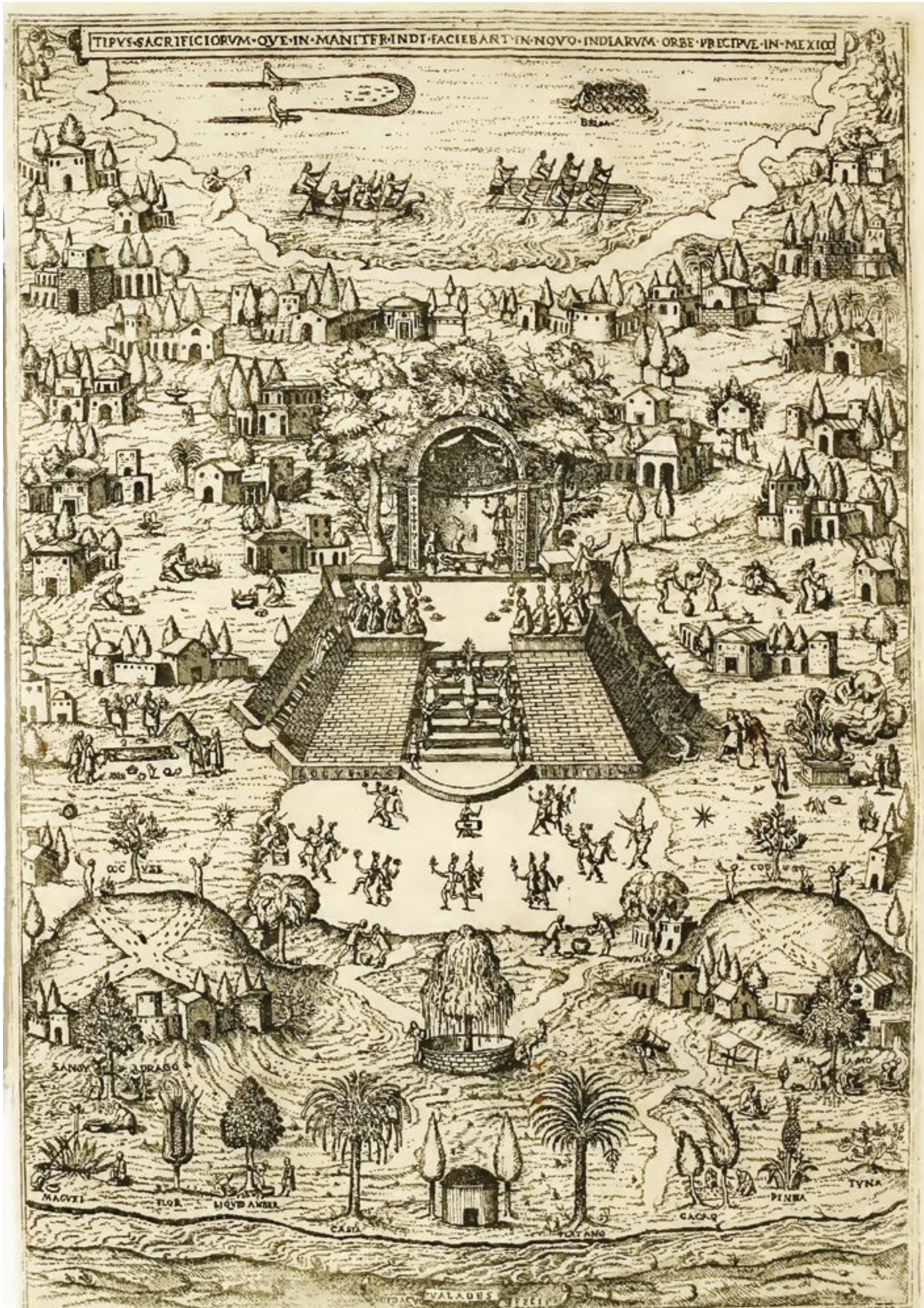

Figure 6. Mnemonic landscape as natural and civil history. Valadés, Rhetorica christiana.

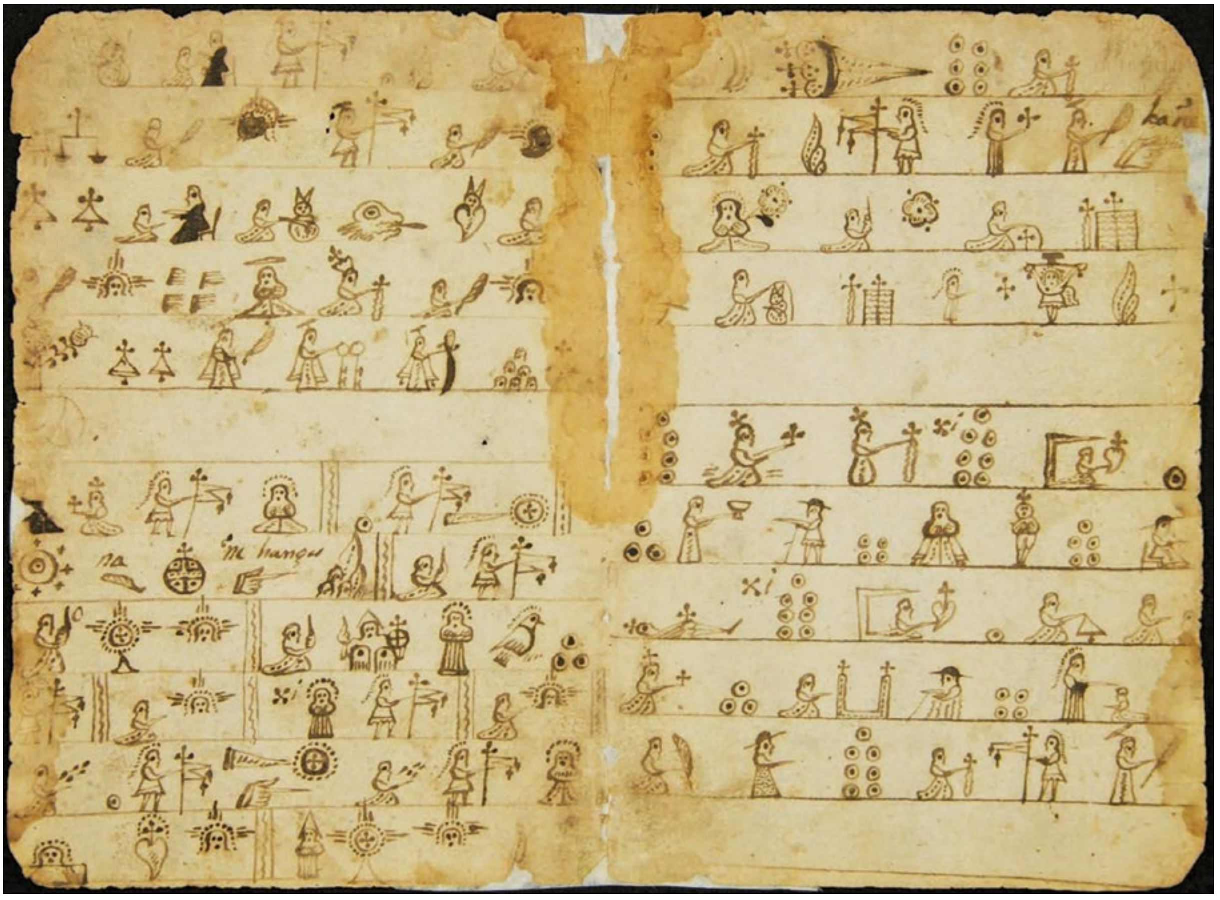

Figure 7. Testerian manuscript, 1524 (CARSO, Mexico; public domain).

these technologies began to appear only three years after the conquest of Tenochtitlan (Figure 7).

For the Franciscans and their trained native vicars cum scribes, images became the most powerful mnemonic device to secure recollection of Catholic principles among the natives. Franciscans created huge canvases to explain to the natives such abstract ideas as the dual temporal and spiritual hierarchies of state power, including the panoply of lay and ecclesiastical bureaucracies. To illustrate complex theological ideas, Franciscans mixed Aztec symbols in hybrid mnemonics. Take for example Valadés' mnemonics for hell and Satan. Valadés depicted Satan as running an Aztec tributary state, with demons delivering guinea pigs, birds, jewellery and sacrificial captives. Then, Valadés turned sinners into Satan's slaves (Figure 8).

Valadés' image of captivity resembled Nahua depictions of slaves, such as those introduced in the 'Huexotzinco Codex' in 1531 (Figure 9). The codex was a written testimony kept by one of the *altepetls* or native lords of the Triple Alliance in litigation against the former president of the Audiencia of Mexico, Nuño de Guzman, for overtaxing the natives.

Valadés' mnemonic synthesis of ancient and medieval cosmography, Aristotelian physics and Neoplatonic hierarchies introduced natives to the concepts of the Great Chain of Being, the Genesis creation and original sin (Figure 10). This synthesis, however, had Mexico at the centre of a hierarchical cosmos. Valadés located Mexican crops (prickly pear and corn), fishes, animals, birds and natives along the central ascending axis of his global natural and preternatural

Figure 8. Satan, hell and Nahua sinners. Valadés, Rhetorica christiana.

hierarchies. Chichimecas and Nahua appeared closer to the church than did Ottomans and Asians.

Valadés understood the nearly 400 missions and monasteries of the Dominicans, Augustinians and Franciscans built in central Mexico, which were heavily plastered with murals and paintings, all to be palaces of memory. Building on Romberch's *Congestorius artificisiose memoriae*, Valadés himself built a palace full of rooms and statues to remember every book of the Old and New Testaments. To recall the Book of Numbers, Valadés chose the image of a seraph next to a column of amethyst. Valadés' entrance to the room of historical books of the Old Testament had a knight on a horse at the doorway. To remember the Book of Judith, Valadés placed a column with a sword and the head of Holofernes. The mnemonic room for the Book of Ruth was made of crystal; it featured the sun atop an Aztec pyramid.

In short, Valadés' mestizo memory palace was half-Aztec in much the same way as that in which the Franciscan monasteries in Mexico were half-Aztec theatres of memory designed for native Christian contemplation and conversion. The secret of Gutiérrez Naranjo's brilliant performances of memory lay precisely in Valadés' *ars memoriae*. This early modern mestizo art of memory created a magnificent archive of the making of knowledge in translation, one that historians continue to learn from.

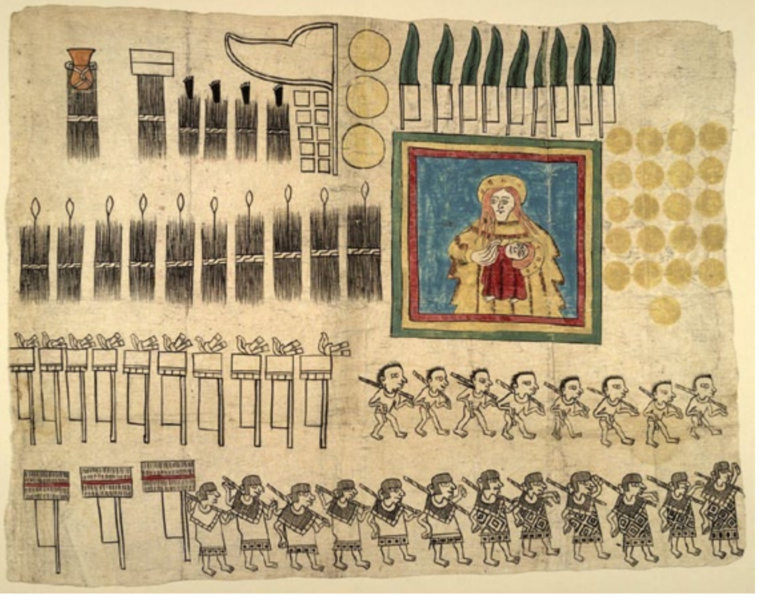

Figure 9. 'Huexotzinco Codex', 1531 (Library of Congress; public domain).

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Figure 10. Mexico within the Great Chain of Being. Valadés, Rhetorica christiana.

CREOLE CABINET

Juan Pimentel and Mark Thurner

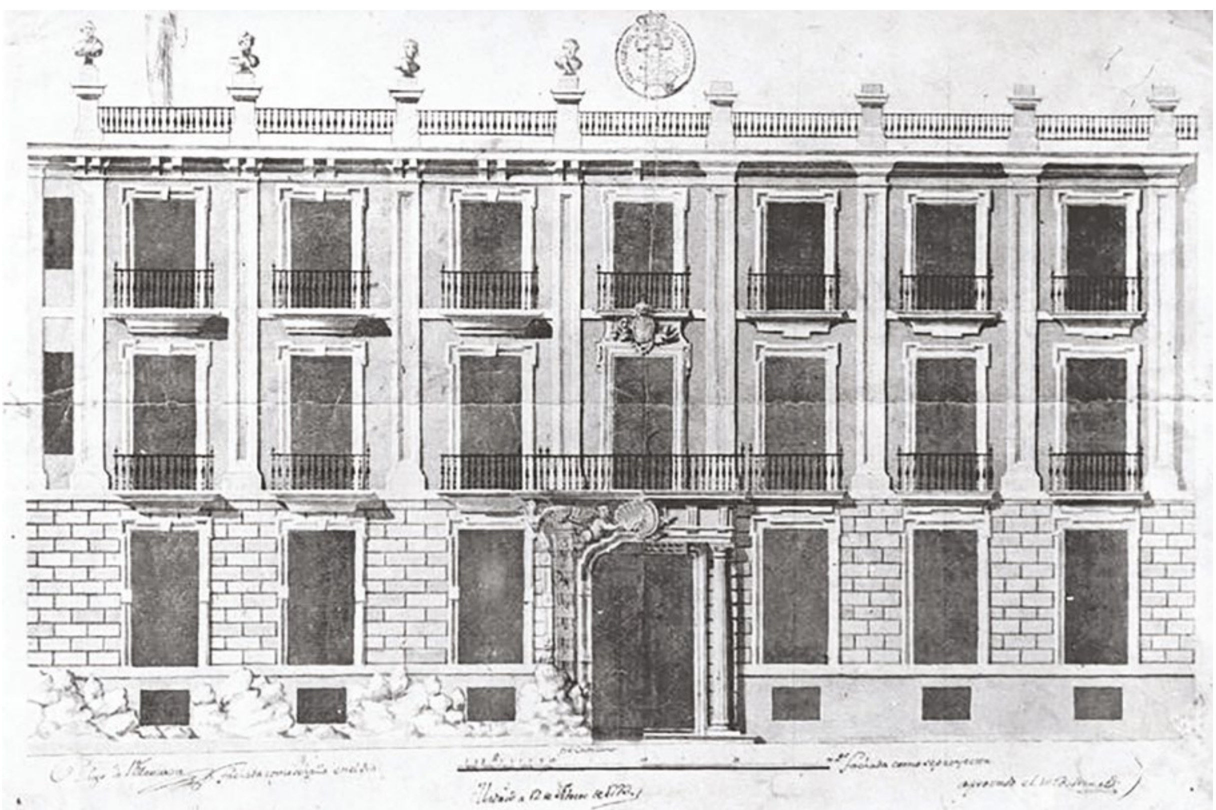

Figure 1. Façade of Goyeneche Palace in Madrid, premises of the Royal Academy of Fine Arts of San Fernando and the Royal Cabinet of Natural History (photographic reproduction courtesy of CSIC).

A cabinet or museum consists of many objects and works, but it too is an object and work with a history. The Royal Cabinet of Natural History, established in Madrid in 1776, is remarkable not only for its Creole origins and royal status but also for its afterlife as a lost project that spawned several museums and whose scattered traces continue to beguile us. Here we sketch not only the actual historical formation of the cabinet that would become a museum but also the hypothetical history that could have been and was not.

The key element of the Royal Cabinet in Madrid was the collection of its founding director, the Guayaquil-born Creole polymath Pedro Franco Dávila. The collection was assembled mainly in Paris, where Franco Dávila, a cacao merchant, dedicated himself to the careful study and collecting of natural specimens. In Paris he frequented salons and rubbed elbows with the leading naturalists and collectors of the day. Over the course of 25 years, Franco Dávila formed a collection that, according to the renowned naturalist Michel Adanson, was 'truly the richest private collection ever assembled'[1]. Its fame caught the attention of the Hispanic monarchy, which had maintained a cabinet of instruments and antiquities as well as a numismatic museum within the Royal Library since 1711 and in 1752 looked favourably upon Antonio de Ulloa's proposal to form a natural history cabinet. After long negotiations (there were interested buyers in London and Saint Petersburg as well), part of the collection was purchased and brought, along with its collector, to Madrid by the agents of Charles III. After several years of waiting in storage, a small space for the cabinet was found in upper-floor rooms at the Goyeneche Palace on the Calle Alcalá, which also housed (and still houses) the Royal Academy of Fine Arts of San Fernando. Fittingly, over the portal of the palace hung the motto *Naturam et artem sub uno tecto* ('Nature and art under one roof'). Though the space was not grand, the location was enviable, near the Puerta del Sol in central Madrid.

The cabinet opened to the public on 4 November 1776. According to the press, it awakened the curiosity of both *madrileños* and visitors to the city. Franco Dávila's collection was particularly rich in shells, minerals and fossils. The collection included all classes of shell, including spherical, cylindrical and conch, brilliant as rubies. Minerals were classified in five orders: calcarean, alkaline, clayey, siliceous and 'figured', that is, naturally sculpted rocks. Finally, there were 'petrifications' or fossils, that is, curious pieces typically found in the cabinets of the day that bridged the mineral, animal and plant kingdoms. The collection also contained artefacts of human industry: paintings by Murillo and Bosch, gilded tobacco boxes, microscopes, weapons, ethnographic objects, Egyptian bronzes, chinaware, Caribbean idols. It was, in a word, a collection of unusual objects whose common denominator was precisely their singularity. Like the better known collection of Hans Sloane (another chocolate merchant with Parisian and Caribbean connections) that gave rise to the British Museum, the rare and curious were united on shelves and in vitrines.

The many gaps in Franco Dávila's curious collection were soon filled by new items from the Indies remitted by scientific expeditions sponsored by the crown. Collaborating in this effort were many botanists, naturalists and navy officers, including Ruiz y Pavón from Peru, Martín Sessé y Lacasta and José Mariano Mociño from New Spain or Mexico, Nicolás de Azara from Paraguay, Juan de Cuéllar from the Philippines, Antonio Parra from Cuba and Alessandro Malaspina in his voyage around the world. The Royal Cabinet was soon inundated with corals, desiccated plants and animals, rocks, fossils and ethnographic pieces. The upstairs apartment of the Goyeneche Palace, which included Franco Dávila's residence, was no longer enough. Indeed, the besieged Franco Davila would request that the remittances be stopped.

The enlightened Charles III, former prince of Naples and the Two Sicilies, now king of the Spains and emperor of the Indies, had grander designs for the Royal Cabinet. In 1785 he commissioned architect Juan de Villanueva, the champion of neoclassicism, to design a magnificent home for the Cabinet of Natural History, along with a chemistry laboratory, a Cabinet of Instruments and Machines and a new, yet-to-be-founded Academy of Sciences (Figure 2). Villanueva's neoclassical palace of science was erected adjacent to the new Royal Botanical Garden. The museum and gardens were part of a comprehensive urbanisation and leisure project set on the outskirts of the city of Madrid. By a twist of fate, however,

[1] M. Adanson, 'Prologue', in P. Franco Dávila and J-P. Romé de L'Isle, *Catalogue systématique et raisonné des curiosités de la nature et de l'art, qui composent le Cabinet de M. Davila...,* (Paris: Briasson, 1767), 2:vi.

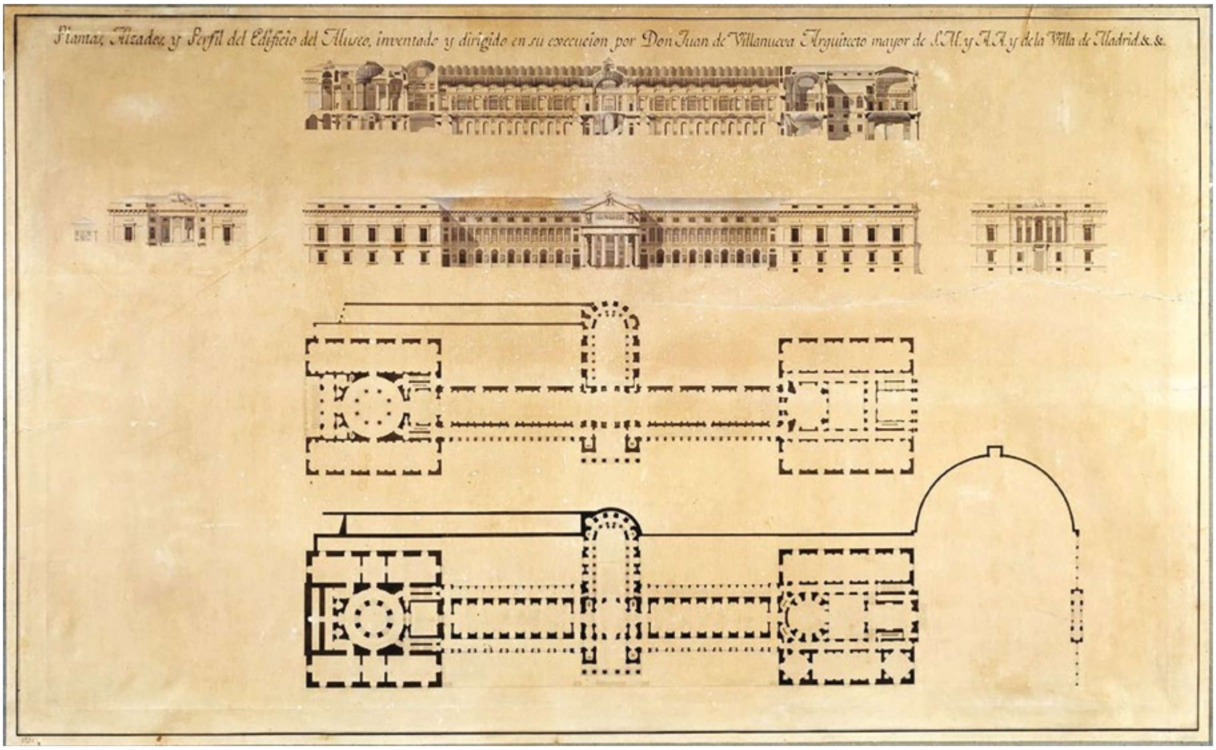

Figure 2. Floors, elevations and profiles of the edifice of the Prado Museum, designed and executed by Don Juan de Villanueva, Senior Architect to His Majesty and to the City of Madrid, etc. (1796, Museo del Prado, D006406; public domain).

Villanueva's natural history museum became the Prado art museum. How did it happen?

Fatal delays in the construction and preparation of Villanueva's museum project meant that Franco Dávila's collections were never installed in what might have been the most high-flying natural history museum in the world. Napoleon's invading army occupied Villanueva's edifice and the surrounding grounds, dismantling its lead roof for shot. Meanwhile, Napoleon's Corsican-born brother Joseph Bonaparte was proclaimed José I of Spain and the Indies. King José I created by decree a new Museum of Painting, in part to house the select booty robbed at bayonet point by French troops from Spain's royal palaces, churches and monasteries, including El Escorial. With the restoration of Ferdinand VII, the reversal of many of the Napoleonic decrees and the Cadiz Constitution of 1812, the Bonapartist painting museum was renamed Museo Fernandino. After the Treaty of Paris, over 200 works were returned to Spain, many from the Louvre. Many more objects were likely lost forever to private collectors. In 1819 Ferdinand VII opened the Royal Museum of Painting and Sculpture in Villanueva's refitted palace of science, today known as the Prado Museum. The museum had been the pet project of his late wife and queen Maria Isabel de Braganza of Portugal, who had died the year before. Although the Royal Museum of Painting and Sculpture was not officially nationalised until 1868, in effect it was born national. It opened in 1819 with an exhibition of exclusively 'Spanish' paintings. In Spain and across Europe, the Napoleonic wake had given birth to national museums of art. By the end of the century, Spain's image of itself was a mirror called the Spanish school of painting. The global museum and academy of science that Charles III had envisioned for the Prado was effectively erased.

Meanwhile, the sidelined Royal Cabinet of Natural History survived in the Goyeneche Palace, where it had its ups and downs. It assisted with the launch of Spain's first scientific journal, *Anales de Historia Natural* (1799), closed during the Napoleonic occupation and limped through the 19th century with scarce budgets and only punctual achievements.

At the end of that century the collection lost its home. After years in basements and warehouses, it was installed in what is today the National Museum of Natural Sciences (MNCN) on the north side of Madrid.

The 19th-century divorce of the sciences from the arts in museums and the culture at large was felt not only in Spain but across much of the world. The break-up of cabinets into disciplinary museums (of art, anthropology, history, natural history, science, etc.) was part of this story, played out in London, Paris, Madrid, Vienna, Prague, Berlin, Rome, Stockholm, Saint Petersburg, Mexico City, Lima, Istanbul, Cairo and elsewhere. In Madrid, the Royal Cabinet was dislodged from its promised land at the Prado but its collections eventually flowed not only into the MNCN but also the National Archaeological Museum (MAN), from which its American components were later passed to the Museum of the Americas (MA). Today, the MNCN, the MAN and the MA all boast exhibits from the Creole Cabinet of Franco Dávila, and each traces its origins to it.

In this regard, the recent temporary exhibit in the Prado Museum of the contemporary artist and curator Miguel Ángel Blanco is instructive, for it made visible for the space of a few months the otherwise hidden consequences of the violent 19th-century separation of the art museum from the natural history or science museum. Blanco's intervention in the permanent collection ran from November 2013 to April 2014 and was provocatively entitled, in a double entendre, *Historias Naturales*. Blanco's audacious gesture juxtaposed natural objects, many drawn from the collections of the MNCN, with Prado masterworks. As Blanco noted, his intention was to make palpable the haunting ghost of Franco Dávila's cabinet, thereby raising the spectre of natural science in a museal space consecrated by the historical triumph of the canvas.

In the first-floor vestibule, for example, Blanco suspended from the ceiling a stuffed royal eagle (*águila real*) poised to attack Leone and Pompeo Leoni's bronze, *Carlos V y el Furor*. Named *El furor de las águilas* (*The Fury of the Eagles*), this arresting scene was the trademark image of the intervention, digitally reproduced on the Prado website and printed and displayed as the exhibit's imposing poster (Figure 3). In one sense at least not unlike Diego Velázquez' *Las Meninas*, Blanco's inaugural scene was an allegory of an allegory, a mirror of a mirror whose ostensible object and subject of representation was defined by the cross of sovereign gazes. 'This naturalised eagle', noted Blanco, 'with its body posed in a posture appropriate to its species, appears to free itself from its symbolic referent, threatening the emperor in its position of attack, hanging from the ceiling.' Nature seemed to challenge the sovereignty of art.

Historias Naturales also drew the attention of museumgoers to the fact that many of the masterworks now hanging in the Prado mix mythical scenes of nature with very precise, naturalistic representations. Blanco thus sought to establish an initially disturbing but also 'harmonising' dialogue between natural science and art. The old dialectic was thus updated with multiple examples: an azurite rock specimen from Chile was placed before the greenish-blue waters of Patinir's sublime *Landscape with Charon Crossing the Styx*; fossils from a petrified forest were set alongside *The Story of Nastagio degli Onesti* by Botticelli. At the far end of the long gallery of the first floor and visible from the vestibule, Charles V's sovereign bronze eyes and ours came to fix on a 'naturalised bull'. In yet another 'harmonious' intervention, Blanco seductively positioned his stuffed *Toro de Veragua* before Peter Paul Ruben's *El rapto de Europa*. As the caption notes, the bull was one of the many forms taken by Zeus. In *El rapto*, it is explained, Zeus 'assumes the form of a beautiful white bull to seduce Europa to approach and caress him'. Europa climbs on his back and is carried off by the deceptive god. A mimetic visual effect of deception is created vis-à-vis the eye of the spectator, for 'the presence of the naturalised bull in the museum attracts and threatens'.

But the halls of the Prado in November are not the streets of Pamplona in July. What was threatened here was not only the spectator's aesthetic expectations but more generally art history's sovereign reign over the halls of the Prado. Blanco's intervention thus reminds us that the trace of Franco Dávila's 'lost' cabinet may yet lead us into a future where the history of science and the history of art once again share the same roof.

Figure 3. The Creole Cabinet Haunts the Prado Museum, Historias Naturales, *M.Á. Blanco (Museo Nacional del Prado, 2013–2014; photo by M. Thurner).*

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MODERN QUIPU

Sabine Hyland and William P. Hyland

Figure 1. Yacapar quipu *(photo by W.P. Hyland).*

Deep in the heart of an Andean village, hidden in a wooden box in a secret chamber under the altar of the colonial church, lie two *quipus*, the knotted and coloured cords used as 'writing' and regarded as sacred by the villagers who guard them today. These mysterious cords are not the precolonial creations of the Incas that may be encountered in museums. Instead, they were created in the 1780s as revolutionary epistles sent from one community to another, calling for a revolt in the name of 'the Inca emperor', the recently executed José Gabriel Condorcanqui, known as Túpac Amaru II. In these two colourful and sensuous texts, we see the ancient and modern Andean art of quipu-making united with the worldwide revolutionary fervour of the late 18th century, making them in effect a pair of historical documents that testify to the regional and global dimensions of knowledge in a small Peruvian village. This piece will focus on one of these two epistles – the Yacapar quipu, created during the festival of Corpus Christi in 1782 and signed with the lineage (*ayllu*) name of its creator, Ciriaco Flores of the neighbouring hamlet of San Mateo de Otao.

Quipus have long occupied a central place in the European imagination concerning 'ancient' South American forms of knowledge. In the 16th century, for example, the Jesuit scholar José de Acosta argued that the Andean knotted texts were a defective form of writing, inferior to Mexican hieroglyphs and Chinese characters, not to mention alphabetic scripts. In Françoise de Graffigny's wildly successful novel *Lettres d'une péruvienne* (*Letters from a Peruvian Woman*), published in 1747, *quipu* missives were the means by which the heroine, Zilia, communicated with her beloved fiancé Aza.[1] Later in the 18th century, the inventor Raimondo di Sangro, prince of Sansevero, asserted that quipus represented the original mark of Cain in the Bible and thus were the oldest form of writing, corresponding to the common human language spoken before the fall of the Tower of Babel.[2] Yet while writers such as Sansevero and Graffigny popularised romantic views of quipus in Europe, the knotted cords continued to be used in

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[1] F. de Graffigny, *Lettres d'une péruvienne* (1747).

[2] R. di Sangro, *Lettera apologetica* (1751).

Figure 2. Sacred archive with goat-hide folders with manuscripts (photo by S. Hyland).

the Andean highlands, in some places until the 20th century. Throughout the Spanish colonial period and beyond, quipus could be integrated into a chain of record-keeping that included written ledgers and account books. In the case of the Yacapar quipu, the corded text provided a means for rebels to communicate secretly.

The community leader, Mercedes Moreyra Orozco, along with other authorities in San Juan de Collata, the village where the quipus have been treasured for over two centuries, invited us to study the two objects. In 2015, funded by a grant from the National Geographic Society, we made the hair-raising journey through the mountains to arrive at Collata, located at an elevation of 3,416 metres in Huarochirí Province, Peru. We were permitted to examine the quipus over the course of two days, under the watchful eyes of two experienced herders, Huber Brañes Mateo and Javier Núñez Torres. The secret box containing the quipus also holds 37 specially prepared goat-hide folders with over a hundred manuscripts, the earliest dating from 1645. Most of the colonial documents are correspondence between the community authorities and the viceregal government; there are also reports of local administrators, inventories of church property and protracted lawsuits against neighbouring communities over land rights. Many Andean communities maintain village archives of 19th- and 20th-century documents, but the manuscripts in Collata's sacred archive are unusually old and plentiful. Indeed, Collata is one of the few remaining villages in the Andes where colonial manuscripts and quipus are known to be preserved together.

Quipus are twisted cord devices that were used for communication and recording information in the Andes during the Inca Empire (*c.*AD 1400–1532), throughout the early modern or Spanish colonial period and even into the 20th century. During the Inca period, quipus were employed for recording numerical data, such as tribute amounts and demographic information; however, Spanish chroniclers wrote that these cords also encoded narratives, such as royal biographies, and were sent as letters from one leader to another. While we can read the numbers on about two-thirds of the quipus known to exist and have gained some understanding of accounting quipus, Andean narrative quipus remain a mystery. Notably, the Collata examples are, as far as we know, the first ever identified as narrative letters by the descendants of their creators.

Both Collata quipus have a traditional Inca format: a top cord from which hang multicoloured pendants. In the Yacapar quipu, the top cord is about two feet long and has 288 pendants in shimmering shades of yellow, red, blue, green, white, black, grey, purple, pink, orange, golden brown, light brown and dark brown, with combinations of up to four colours together in a single pendant. Huber and Javier identified the animal fibres used to make the pendants (in order of decreasing frequency): vicuña, alpaca, guanaco, llama, deer and an Andean rodent known as a vizcacha. Huber insisted that the difference in animal fibre was meaningful, and he referred to the quipus as 'a language of animals'. In many cases, the only way to distinguish the type of fibre was by touch, and the herders insisted that we remove our gloves to handle the quipus with our bare hands. The pendants are differentiated not only by colour and fibre type but also by the direction of their final twist – 58 per cent are twisted to the right (S ply), while 42 per cent are twisted to the left (Z ply). Ply direction is known to be meaningful in quipus and this ratio is nearly identical to that of Inca-period animal-fibre quipus: 59 per cent to 41 per cent.

Figure 3. Collata quipu pendants (photo by S. Hyland).

In Collata, when a man first accepts a major communal responsibility, such as sponsoring the festival in honour of the Virgin of the Assumption, he is shown the contents of the hidden archive. Senior men inform the younger ones that native leaders made the quipus as epistles (*cartas*) about their wars on behalf of the Inca emperor in the 18th century. They say that the quipus were created around the time of a legendary local chief, Pedro Cajayauri, whose signed letter to colonial authorities, dated 1757, is kept with the other manuscripts.

Led by Felipe Velasco Túpac Inca Yupanqui, a cousin of José Gabriel Condorcanqui Túpac Amaru II, in 1783 the people of Collata joined an insurrection that had convulsed the Southern Andes. Túpac Amaru's capture and execution in May 1782 had seemed to signal the end of the unrest, but Felipe Túpac Inca nevertheless encouraged his followers by telling them that Túpac Amaru's execution or quartering in the plaza at Cusco had been a fiction. The Inca emperor, he claimed, had escaped and was living in the lowland kingdom of Paititi with over four thousand jungle warriors at his command.

Felipe Túpac Inca, the leader of the 1783 uprising, was born in Cusco around 1753, the son of Don Juan Velasco Túpac Inca Yupanqui and Doña Gregoria Túpac Amaru. His parents were both natives of Cusco and members of the indigenous elite of the former Inca capital. Through his father, Felipe claimed descent from the emperor Túpac Inca Yupanqui; through his mother he was related to Túpac Amaru II. At the age of seven, Felipe moved to Moquegua to live with relatives before relocating to Lima, where he eventually began a relationship with the widowed mestiza Manuela Marticorena.

In Lima, Felipe lived with Manuela, her children from her former marriage and their daughter Lorencita, next to Manuela's store on the Plaza de la Buena Muerte, located in the historic centre of Lima in what is today the neighbourhood of Barrios Altos. Manuela sold religious items, including statues, paintings and prints of Christ and the saints, along with wooden crucifixes. Felipe had a workshop in the store where he painted and decorated religious objects, creating many of the pieces for sale in Manuela's shop. One of his specialities was cutting mirrors to use as decorations on shrines and holy images, earning him the nickname 'Mirror Maker' ('*Espejero*').

For years prior to the 1783 rebellion, Felipe travelled throughout the northern Huarochirí region, in Collata and elsewhere, hawking his religious wares and repairing shrines and sacred artefacts. According to witnesses, he openly began to organise the rebellion in Huarochirí in the latter half of 1782. Felipe preached that the Indians of the land must free themselves of their oppression by the viceroys, *corregidores de indios*, and the secular priests, creating a new kingdom in which all men are 'brothers . . . those of [our] nation as well as Spaniards, Blacks, sambos and all castes without any inequality of persons' ('*hermanos . . . asi de su nación como españoles, negros, sambos y todas castas sin desigualdad de persona*').[3] His declarations of the equality of men resonate with similar declarations of other revolutionaries across the Americas and Europe at this time. Felipe proclaimed himself the royal representative of his cousin, Túpac Amaru II, demanding that he be treated with the same respect and obedience owed to the Inca monarch in the jungle. Elegantly attired in a lilac blue silk frock coat, with mauve frills, black velvet breeches, silk hose, white boots, a tricornered hat and a steel sword strapped to his waist, Felipe must have cut an impressive figure.

The actual revolt began on 30 May 1783, when Felipe read out his proclamation of independence, commanded his followers to destroy all the bridges on the roads to Lima and captured and tried several Spanish loyalists. However, one of his captains betrayed him, imprisoning Felipe and sending word of the uprising to the local corregidor. The men of Collata, along with those of neighbouring Chaclla and Jicamarca fought to free their Inca leader, but to no avail. Felipe and other rebel leaders were brought back to Lima, where they were interrogated and tried. Felipe and his captain-general, Ciriaco Flores, were executed, while other leaders were flogged and exiled to Africa.

From the over one thousand pages of testimony from the Spanish interrogations of the prisoners, we can ascertain when the Yacapar quipu was probably created, by whom and what it said. Spanish authorities questioned the prisoners relentlessly about the messages sent in the revolt, allowing us a glimpse into the quipu letters as well as the alphabetic ones. During the festival of Corpus Christi in 1782, Felipe and Ciriaco holed up in Ciriaco's farm outside of San Mateo de Otao, an annex of the village of Casta, which is adjacent to Collata. Ciriaco was a prosperous farmer and member of the Yacapar clan who had first met Felipe when the latter was repairing a saint's canopy in the Otao church. The two men had discussed revolution for years, but during this week in late June they planned their uprising, with Ciriaco swearing an oath of loyalty as captain-general of Felipe's army. Ciriaco was alphabetically illiterate, unable to read or write in Spanish, yet he created physical letters for the leaders of neighbouring towns, calling on them to revolt. It is apparent that the Yacapar quipu, signed with the name of Ciriaco's clan or ayllu affiliation, is one of the quipu letters that Ciriaco created at this time.

It is instructive to see in Collata how the quipu form may have been used to mobilise villagers and convey ideals of equality and justice common to the Age of Revolution in Europe and the Americas. Likewise, and although extremely rare, it is heartening to know how carefully the villagers in Collata have actively preserved these two precious emissaries from that age.

[3] Archivo General de Indias, 1047, Uprising of Topa Inca Yupanqui in Huarochiri, 1783. Testimony of Thomas Palomino, June 11, 1783, frv. 285.

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INCA MUMMY

Christopher Heaney

Where do mummies come from? Most of us would answer 'Egypt' without missing a beat. But in 1823, George IV, king of the United Kingdom of Great Britain, Ireland and Hanover, learned that they also came from Peru. The king's new knowledge was the result of a gift that Peru's liberator, the South American revolutionary José de San Martín, had sent him as proof of Peru's ancient glory and renewed sovereignty. San Martín hoped that the king's gifted Inca mummy would end up in the British Museum (Figure 1).

The Inca did not look like any mummy in the British Museum in Bloomsbury, nor any then found in the more accessible Egyptian Hall in Piccadilly, where supposed pharaohs were unwrapped outstretched before a paying, murmuring public. By contrast, mummies from South America were preserved in a seated position. This made them seem positively lifelike, as Basil Hall, the British naval captain who escorted this particular ancient Peruvian across the Atlantic, noted. 'My friend the Inca', as Hall later remembered him, travelled with his 'knees almost touching his chin, the elbows pressed to the sides, and the hands clasping his cheek-bones.' To Hall, it was somewhat touching. In the Inca's 'countenance', Hall recalled, 'there was an expression of agony very distinctly marked'.[1] But the Crown seems to have thought otherwise. Rather than going to the British Museum, King George's Inca counterpart went to the Hunterian Museum of the Royal College of Surgeons, where he was displayed not as a product of embalming but as a specimen of *natural* preservation, whose desiccation owed to dry Peruvian air and 'the peculiar character of the soil'. The 'painful-looking figure raised upon a pedestal', as one London guidebook from the 1840s put it, was also demoted from royal Inca status. Instead, the mummy was presented as merely the 'body' of a lesser lord who had sacrificed himself before Peru's conquest. King George's Inca mummy had become neither Inca nor mummy, but a 'dreadful instance of the lengths to which man's wild imagination will carry him'.[2]

This view, however, was a dreadful mistake. Hiding within King George's Inca mummy and his demotion by British experts to a ghastly specimen of naturalist curiosity was a neglected history of Andean and

[1] Basil Hall, *Extracts from a journal, written on the coasts of Chili, Peru, and Mexico, in the years 1820, 1821, 1822* [1823] (Edinburgh: Archibald Constable and Co. Edinburgh/London: Hurst, Robinson and Co., 1825), vol. 2, 71; Basil Hall to James Paroissien, 22 December 1823, and James Paroissien to Sir William Knighton, n.d., Records of James Paroissien and the Beuzeville Family (RJP), D/DOb C1/29, Essex Record Office, UK.

[2] Charles Knight, ed., *London* (London: Charles Knight, 1841–4), vol. 6, 207.

Figure 1. Detail of San Martín's embalmed Inca ancestor, plate 6. Thomas Joseph Pettigrew, A History of Egyptian Mummies *(London: Longman, 1834).*

Hispanic science. Andeans had once applied their knowledge of local climates and the human body to project their ancestors into the future. Spaniards and their Peruvian descendants contested that lifelike and divining state by focusing on its science, claiming that Andean forefathers were not holy beings but skilfully embalmed ancestors. The removal of King George's gifted Inca to the Hunterian not only threatened to bury that chain of Andean-Hispanic knowledge, but also extended Hispanic science's earlier efforts to demote the Andean dead from sacred beings to mere specimens.

Did the Incas and other precolonial South American peoples and civilisations mummify their dead? The arid west coast of South America is in fact home to the world's *oldest* mummy culture. The Chinchorro, of what is today northern Chile, began preserving their deceased family members upwards of eight thousand years ago, some two to three thousand years before the Egyptians. The Chinchorro did so for distinct spiritual and political reasons, as would every other South American culture that practised mummification over the millennia. Seated mummies were wrapped and plated along the Pacific coast like seeds to be watered, to summon fertility for their communities further inland. In the Andes, communities preserved their more select dead in open tombs so that they could consult and interact with them regularly, 'feed' them and carry and display them in processions (Figure 2).

The Incas made the practice an apex of empire – what ethnohistorian Isabel Yaya McKenzie has called an 'embodied technology of power'.[3] In the late 15th century, the Incas appear to have developed a set of more elaborate mummification rituals, removing the intestines and heart of the deceased Inca emperor and his consort, 'seasoning him without breaking a single bone', and then '[curing] him in the sun and the air'.[4] Once dried, the ancestor was dressed and borne on litters adorned with feathers and gold, all of which rendered them *yllapa*, sacred and shining.

As yllapa, the Inca dead remained animate and socially alive. A year after their death, they were returned to the great plaza in the Inca capital at Cusco for a social reintroduction, or *purucaya*, in which they re-occupied their palace with the housewares, jewellery and clothing that sustained their immediate royal family line, or *panaqa*. Panaqa members interpreted their yllapa's will and consulted them on a regular basis regarding royal marriage alliances. In the name of both living and dead, the mummies' attendants sang their ancestors' illustrious histories while planning their houses' futures.

This practice of propagating living Inca ancestry was a spur for empire-building. Inca rulers encouraged their subjects to venerate them as the solar ancestors of humanity, justifying their rule. And because each

[3] I. Yaya McKenzie, 'Sovereign bodies: ancestor cult and state legitimacy among the Incas', *History and Anthropology,* 26, no. 5 (2015), 641.

[4] F. Hernández Astete and R. Cerrón-Palomino, eds., *Juan de Betanzos y el Tahuantinsuyo: nueva edición de la suma y narración de los Incas* [1550s] (Lima: Fondo Editorial de la Pontifica Universidad Católica del Perú, 2015), f. 97v.

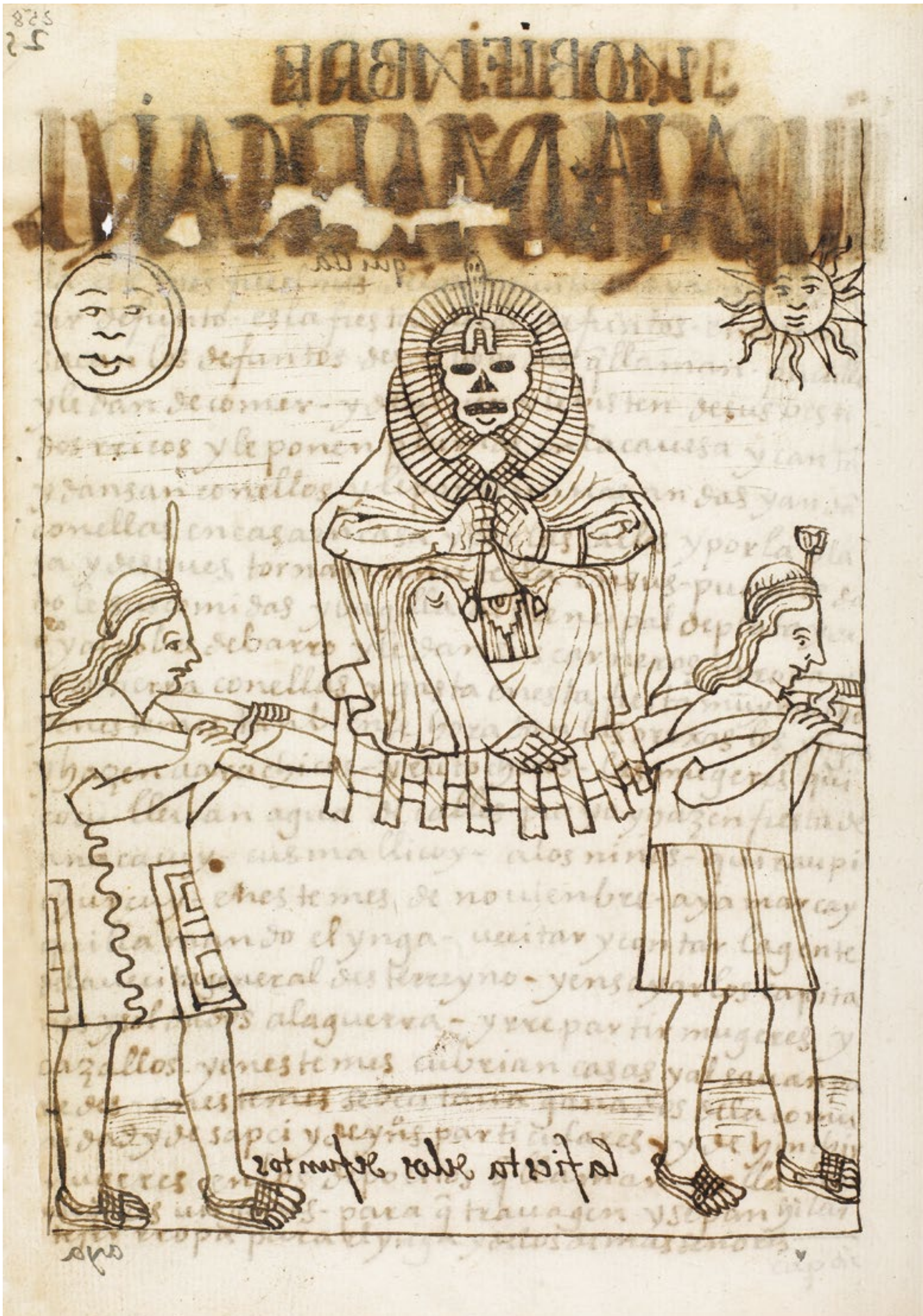

Figure 2. 'The eleventh month, November; Aya Marq'ay Killa, month of carrying the dead'. Felipe Guaman Poma de Ayala, El primer nueva corónica y buen gobierno *(1615), 256 [258].*

new living Inca emperor could only inherit the title of *Sapa Inca*, or supreme Inca, from his father, potential heirs were spurred on to make conquests of their own. To support their own future mummy cult with new territories and tributes, Inca heirs marched south from Cusco to what is today northern Chile and Argentina and north to what is today southern Colombia. These campaigns were successful, in part, because they were preceded by a shared Andean culture of ancestor mummification. Shared Andean understandings that ancestry inhered in mummies or other sacred forms meant that the Incas could 'honour' their subjects by carrying their embalmed or living dead to Cusco. Archaeologist George Lau has suggested that this practice of 'collecting' the honoured dead was 'not unlike that of many colonial projects in world history which filled the treasuries, museums and zoos of expanding nations'.[5]

We know as much as we do about Inca and Andean technologies of the living dead because of how closely Hispanic chroniclers, friars and doctors studied them in the 16th century. In 1533, the first Spaniards to arrive at Cusco entered the palace of the recently deceased Inca emperor Huayna Capac and his *coya*, or empress. They proceeded to strip their bodies of their gold, although not before removing their shoes, as the royal couple's gold-masked attendant demanded. By 1534, other Europeans could read about this encounter through the words of one of Pizarro's secretaries, who described the Inca couple using a very specific term: 'two Indians in the manner of *embalsamados*', that is, 'embalmed ones'.[6]

This account was not just a description. It was anatomical and botanical intelligence, which reduced Andean practices of ancestor worship to what interested early modern European elites: knowledge of the art and anatomy of preserving and memorialising their own dead. To write that the Incas 'embalmed' their dead was to evoke the ancient Egyptians, whom Europeans sought to emulate using expensive Near Eastern *materia medica*: aromatic spices, myrrhs, aloes, resins, bitumens and, of course, liquor from the balsam tree, whose Egyptian supply is believed to have dried up in the early 16th century. If the Incas embalmed their dead, then they might have their own balsam. The Spanish crown seemingly confirmed this in 1536, when it received a sample of 'balsam of Peru', still stocked in medicine cabinets today.

The Inca yllapas had shorter shelf lives than the Peruvian balsam. In 1559, after a quarter century in which the Incas engaged creatively with early modern Christianity while continuing to venerate their living dead, crown official Juan Polo de Ondegardo rounded up the surviving embalsamados around Cusco and packed them off to the viceroy in the new coastal capital founded by Pizarro at Lima. Church and state officials worried that the ruling Inca dead were being venerated as false saints. But the confiscation likely also resonated for Andean subjects. Like the Incas who came before them, the Hispanic crown asserted their empire by taking hostage the elite dead of its subjects, including the emperor Pachacuti Inca Yupanqui; his eldest son, Amaru Topa Inca; Mama Runtucaua, the emperor Viracocha's wife; Mama Ocllo, Huayna Capac's mother; and Huayna Capac himself, who was so well 'cured' that he 'appeared to be alive. His eyes were made of a thin golden cloth; his hair grey, and he was completely preserved, as if he had died the same day' (Figure 3).[7]

This hostage-taking yielded its own fraught knowledge. These Inca embalsamados were displayed in Lima's Hospital of San Andrés. The Jesuit scholar José de Acosta examined them and theorised the means of their incredible preservation. He wrote that Pachacuti was 'so well preserved and adorned with a certain *betún*' – a resin or bitumen with powerful Egyptian associations – 'that he seemed alive'. It is possible that Acosta may have done more than merely observe and speculate, however. Years later, another Jesuit erudite observed that the faces of the Andean dead were so well preserved 'because under the skin there was a calabash rind in each cheek, over which, as the flesh dried, the skin stayed tight, with a nice

[5] G.F. Lau, *Ancient Alterity in the Andes: A Recognition of Others* (London and New York: Routledge, 2013), 87.

[6] Anonymous, 'La conquista del Perú, llamada la Nueva Castilla (Sevilla, 1534)', in A.M. Salas, M.A. Guérin and J.L. Moure, eds., *Crónicas iniciales de la conquista del Perú* (Buenos Aires: Editorial Plus Ultra, 1987), 110.

[7] B. Cobo, 'Historia del Nuevo Mundo', in *Obras del P. Bernabé Cobo de la Compañia de Jesus*, F. Mateos, ed. (Madrid: Ediciones Atlas, 1956), vol. 2, 82.

Figure 3. The Defunct Inca Guayna Capac, Illapa, being carried to Cuzco from Quito. Guaman Poma de Ayala, Nueva corónica, *377 [379].*

gloss'. At some point, the Jesuits probably started dissecting the ancestors of their Andean subjects.

That process of anatomical investigation may have contributed to the vanishing not just of the yllapa but of countless other mummified ancestors as well. By the early 17th century, some friars were confiscating the venerated dead of more rural Andean communities and burning them, accusing their descendants of idolatry. Our last recorded glimpse of the preserved Incas places them in a corral at the Lima hospital in the mid 17th century, after which – it is presumed – they fell apart and were buried somewhere nearby.

By that point, however, their preservation on paper had been guaranteed by a slow-moving scholarly conversation over whether they were in fact 'mummies' – a category of embalmed dead originally associated only with Egypt and the Near East, whose flesh Europeans consumed as medicine. In the mid 16th century, French writers entertained but then rejected the possibility that such medicalised mummies could also come from Peru: mummies came only from Egypt. But in the early 17th century, two important Andean chronicles or histories, one world famous and the other unpublished and largely unknown before the early 20th century, provided suggestive evidence of the extent and meaning of Inca mummification practices. The Jesuit-trained Andean chronicler and scribe Guaman Poma de Ayala wrote and illustrated a 1,180-page *Letter to the King* that described in some detail the social lives of the embalsamados and the differences in how Andean ancestors were preserved (Figures 2 and 3). Far more widely read and translated was the *Comentarios reales de los Incas* of Inca Garcilaso de la Vega, whose father was a Hispanic conquistador and whose mother was a niece of the Sapa Inca Huayna Capac. Readers across Europe marvelled at Inca Garcilaso's memory of encountering the yllapa body of his great-uncle and his fellow embalsamado dead in 1559, in the home of the viceregal official Polo de Ondegardo, who had collected them. Inca Garcilaso lamented not having asked his family for the exact means of their preservation. 'They would not have denied me, as they have denied the Spaniards.'[8]

[8] I. Garcilaso de la Vega, *Comentarios reales de los Incas* (Lisbon, 1609), vol. 1, 127.

Translators burnished Inca Garcilaso de la Vega's memory of his ancestors' embalmed bodies still further. In the first full English edition of *The Royal Commentaries of Peru in Two Parts* (1688), translator Sir Paul Rycaut expanded on Inca Garcilaso's speculations as to the manner of embalming using 'bituminous matter' with a bold claim. For Rycaut, 'these Bodies were more entire than the *Mummies*, wanting neither Hair on the Head, nor Eye-brows, and even the very Eye-lashes were visible.'[9] Rycaut was not saying the Inca dead were mummies like the Egyptians: they were, in terms of the skill employed in embalming, even more impressive.

Some readers were suspicious, but in the 18th century, a French naturalist and anatomist named Louis Jean-Marie Daubenton thought that the accounts of Acosta and Inca Garcilaso of the Peruvian dead were credible enough, and in a key essay of the Enlightenment allowed that Incas made mummies like the Egyptians. In 1792, during the dedication of Lima's first anatomical theatre, the enlightened Peruvian anatomist and statistician José Hipólito Unanue noted that the Incas were anatomists *par excellence*. 'If the progress that the ancient Peruvians made in that science had been measured by the preparation and conservation of cadavers, which requires a certain skill and intelligence, without a doubt they would dispute the precedence given to the Egyptians.' Likening them to the famed Dutch embalmer Frederik Ruysch, Unanue opined that 'the Peruvians perpetuated the life of their mummies, while the Egyptians only prolonged the death of their own'.[10]

It was in the name of these lost Inca or ancient Peruvian mummies that General José San Martín sent to King George IV his own specimen – a potent symbol of Peruvian sovereignty and enlightenment, bound to the patriot cause of independence from Spain. That

[9] I. Garcilaso de la Vega, *The Royal Commentaries of Peru in Two Parts*, P. Rycaut, trans. (London: Miles Fletcher, 1688), vol. 1, 182, 193.

[10] J.H. Unanue, 'Decadencia y restauracion del Peru: oracion inaugural, que para la estrena y abertura del anfiteatro anatómico, dixo en el Real Universidad de San Marcos el día 21 de Noviembre de 1792', *Mercurio Peruano* (Lima, 1793), 117.

the 'Inca mummy' was the body of another precolonial Andean unfortunate, disinterred to reincarnate the lost yllapa, does not lessen the powerful message, even if the demotion to the Hunterian Museum, to status of an anonymous, naturally preserved corpse, suggests that much was lost in translation. If anything, these transformations set the ironies of King George's Inca in starker relief. Just as Hispanic friars and royal officials tried to overwrite the radically animate potential of Inca ancestor-making by calling it embalming – a practice whose products and science Europe might claim – England's surgeons overwrote the mummy's embodied history of Andean and Hispanic science by labelling him a 'natural' specimen of Peru's climate and its ancient 'race'.

This demotion of King George IV's embalmed Inca was only a British blip on the screen in what became the global career of Peruvian mummies. In the decades following, more and more 'ancient Peruvian' and 'Inca' mummies were collected and displayed not only in Great Britain but in France, Prussia, Portugal and the United States. Today, the idea that the Incas and other Andeans made mummies is accepted as a matter of course by scientists, even if they are still seen as the junior partners to their more storied siblings the Egyptians.

Yet there was something of the uncanny in the Peruvian mummies that the Egyptians lacked and that the British naval captain Basil Hall had noted while escorting King George's Inca across the Atlantic. Through the 1840s, Peruvian mummies were carted about the English and Scottish countryside as travelling natural history spectacles; their life-like quality allowed them to settle alongside Egyptians in new tombs – the museums and the collections of antiquarian societies – throughout Europe and the United States. After an encounter in Paris with a Peruvian mummy like that of King George, artist Paul Gauguin hid them in his paintings as signs of fertility and death. It has even been suggested that Edvard Munch took from a Peruvian mummy in France the pose of existential horror that made his famous painting *The Scream*, now hanging in sombre Oslo, so haunting.[11]

[11] R. Rosenblum, *Modern Painting and the Northern Romantic Tradition: Friedrich to Rothko* (New York, NY: Thames and Hudson, 1975), 111.

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XILONEN

Miruna Achim

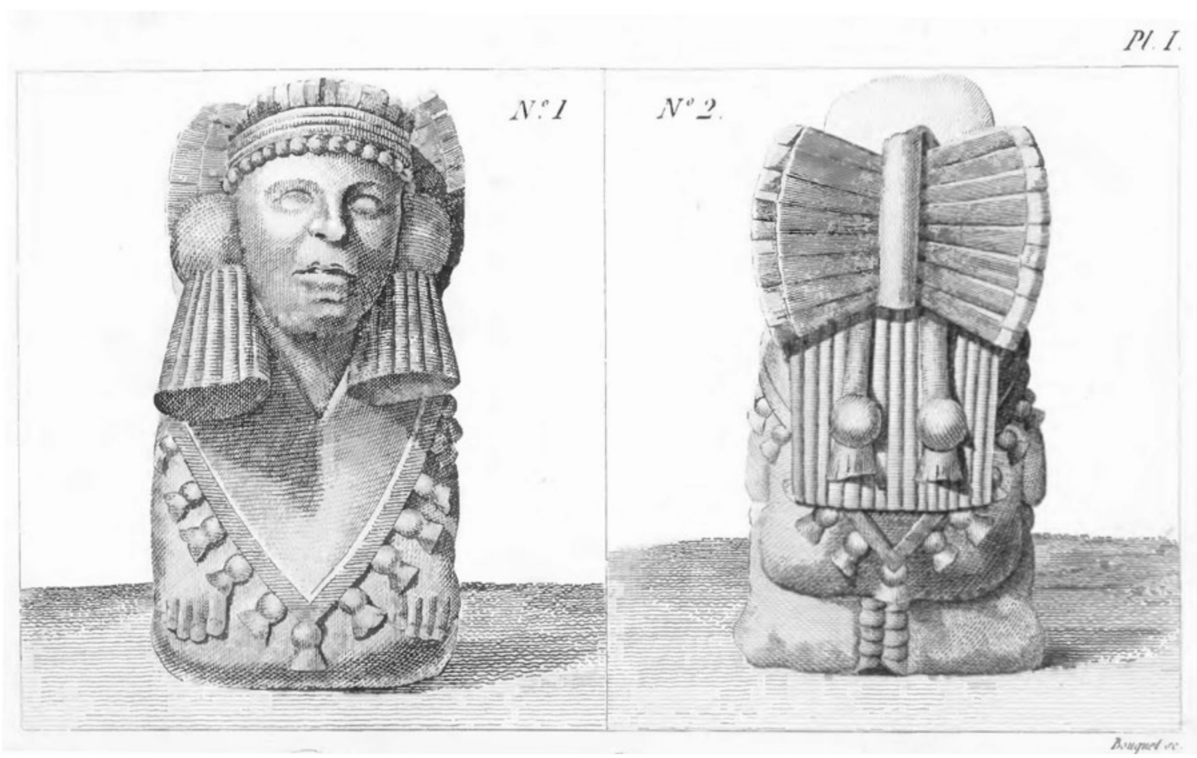

Figure 1. Bust of an Aztec Priestess. Alexander von Humboldt, Vues des cordillères et monuments des peuples indigènes de l'Amérique, *plate 1 (Paris: Schoell, 1810–13).*

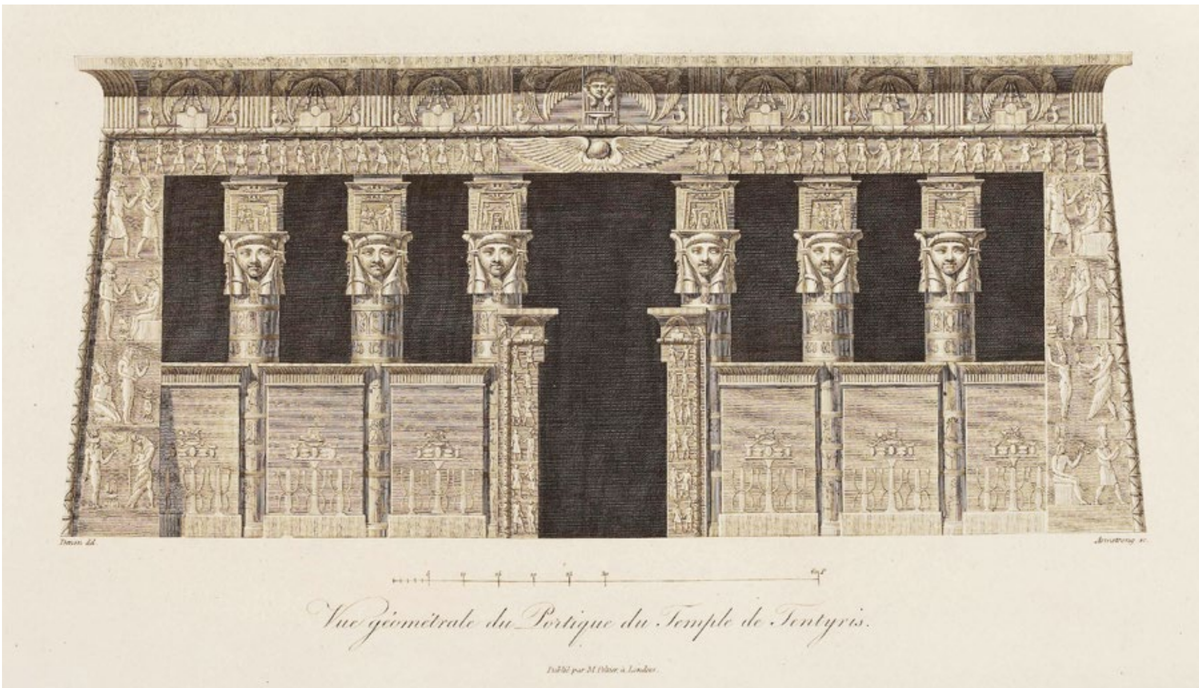

Figure 2. Temple of Hathor at Dendera. V. Denon, Voyage dans la basse et la haute Égypte *(1802).*

Alexander von Humboldt's *Vues des cordillères et monuments des peuples indigènes de l'Amérique* is a striking album of 69 'views' of 'natural' and 'artificial' or human-made monuments, which the author 'collected' over the course of his travels in the Americas between 1799 and 1804.[1] The ancient ruins at Mitla, the great pyramid at Cholula, the fortress at Xochicalco, stone figurines, ceramic vessels and 'hieroglyphic paintings' (codices) alternate with 'views' and descriptions of a sublime and agitated nature: the Chimborazo volcano, the basaltic prisms at Santa María Regla in New Spain and the Tequendama Falls on the Bogotá River. Humboldt had first-hand knowledge of many of these objects and places; for others, he relied upon the drawings and depictions made by Creole savants or on his exchanges with local informants.

It is no accident that the Parisian album of New World curiosities opens with an engraving of the sculpture of an 'Aztec priestess' which Humboldt saw in the collection of Guillermo Dupaix, one of New Spain's foremost antiquarian scholars, during his residence in Mexico City in 1803 (Figure 1). Dupaix's 'priestess' reminds Humboldt of a similar 'idol' he collected in the ruins in Texcoco outside Mexico City and later deposited in King Frederick Wilhelm III's collection in Berlin. But Humboldt is especially struck by the apparent resemblance between the headdress of the Aztec priestess and that of a Greek statue of Isis in the Villa Ludovisi in Rome and indeed of the heads embedded in the capitals of the columns at the Temple of Hathor at Dendera in Egypt (Figure 2), which Humboldt saw in Vivant Denon's recently published *Voyage dans la basse et la haute Égypte*.[2] On the basis of conversations with Georg Zoëga, a scholar of ancient Egypt and curator of Mexican codices in the Borgia collection, Humboldt decides that the distinctive feature at the back of the statue's head, which he takes to be a purse-like knot that ties her hair, resembles

[1] A. von Humboldt, *Vues des cordillères et monuments des peuples indigènes de l'Amérique* (Paris: Schoell, 1810–13).

[2] V. Denon, *Voyage dans la basse et la haute Égypte, pendant les campagnes du Général Bonaparte* (Paris: P. Didot, 1802).

sculptures of Osiris. In addition, the so-called Aztec priestess's triangular 'skirt', decorated with 24 symmetrically placed bells, reminds Humboldt of the robes of the 'grand priest of the Hebrews'. To be sure, Humboldt also notes differences between the New and Old World artefacts. He notes that the string of 'pearls' around the head of the Aztec priestess looks nothing like the adornments of Egyptian statues; instead, they are, he guesses, evidence of commercial ties between ancient Mexico and the Californias. And the materials used for Mexican and Egyptian statues are different: the Aztec priestess is carved in 'true' basalt, which is black and hard, unlike porphyry, 'which antiquarians commonly call Egyptian basalt'. Humboldt, like most other contemporary scholars of Mexican antiquities, cannot but wonder how the ancient Mexicans could have carved such a hard stone without metal tools.

What should we make of Humboldt's orientalist reading of the 'Aztec priestess'? Finding affinities between ancient Mexican and Egyptian artefacts falls today in the realms of pseudoscience, science fiction and fake news. During Humboldt's lifetime and indeed into the early 20th century, however, such comparisons not only did not raise eyebrows but were de rigueur among the learned. Ancient Egypt and the Orient at large had been a point of reference for chroniclers of the New World ever since exotic artefacts from the Americas or Occidental Indies began to circulate in Europe in the 16th century. However, at the beginning of the 19th century, when Humboldt was writing his *Vues*, in the minds of many, several developments brought the ancient civilisations of America and Egypt even closer together.

On the one hand, quite literally, the increasing circulation and accumulation of both ancient Egyptian and Mexican objects in the same spaces of display, such as the Louvre, the British Museum or the Royal Cabinet of Natural History in Madrid, made them increasingly accessible for comparative study. On the other hand, such comparisons were taking place in the context of unprecedented popular and scholarly interest in all things Egyptian, following Napoleon's campaigns in North Africa. Denon's *Voyage*, one of the earliest reference books on ancient Egypt, now brought the zodiac of Dendera to the attention of the French public. Denon's engravings of the zodiac became the focus of fierce controversies, which pitted supporters of the biblical narrative against those who thought the world was much older. Humboldt, who was in Paris at the time working on his *Vues*, apparently did not take sides in the controversies. Still, the debates found their way into his writings, especially in his comparative studies of timekeeping systems of the Old and New Worlds.

The increasing proximity of Mexican and Egyptian artefacts, however, is only part of the story of why Egypt was a recourse for studying ancient Mexico. Increasingly, it was the notion of 'style' and, in this case, Egyptian style which moved scholars to lump otherwise distant cultures or civilisations under one label. How did the concept of style work? How did it serve to produce knowledge about and assign value to Mexico's ancient past?

Style, writes the Italian historian Carlo Ginzburg, is a category of exclusion (as in the signature style of an artist) and inclusion (as an expression of the taste that dominated a certain age, nation or civilisation). It is style as an inclusive category that most interested Johann Joachim Winckelmann (1717–68), although his evolutionary theory of style would turn out to be rather exclusive. Winckelmann was one of the most prominent and influential thinkers of the Enlightenment on art history and aesthetics. Borrowing from contemporary thinking in natural history, Winckelmann rejected a model of the history of art centred on artist biographies or on single works of art to produce instead an evolutionary, aestheticist, object-oriented history of art that privileged ancient Greece. In *Geschichte der Kunst des Alterthums*, Winckelmann postulated that a uniform, evolutionary pattern marks the history of art, which unfolds, from origin to decline, in phases corresponding to artistic stages in the representation of the human figure.[3] For Winckelmann, the Greek nude figure was a culminating moment in art history. In his scheme, Egyptian and Etruscan artefacts were imperfect preludes, while Roman sculpture was the tail end of the period, when art had reached its apogee. Winckelmann further suggested that style is

[3] J.J. Winckelmann, *Geschichte der Kunst des Alterthums* (Dresden, 1764).

shaped by climate and the political regime; hence, the history of civilisation could be read as a sequencing of styles. In short, style was in Winckelmann's influential formula a universal material index of human progress.

In *Vues des cordillères et monuments*, Humboldt rehearses many of Winckelmann's theories. Building upon Winckelmann's idea that artistic productions are expressions of their immediate surroundings, Humboldt proposed that the 'coarseness of style and the lack of correction' of American antiquities were determined by climate, the physiognomy of vegetation and especially the fact that the peoples of America were at war against 'a perennially savage and agitated nature'. In the Americas, the shape of antiquities was dictated by the massiveness and extremeness of the topography: 'volcanoes with their craters surrounded by eternal snow . . . the contours of mountains, valleys with their furrowed flanks, and imposing waterfalls.' The supposed lack of political freedom that, for Humboldt and many other European philosophes, had prevailed in the ancient Americas further helped explain why pre-Columbian aesthetics deviated 'from the ideal artistic style, in which the Greeks have bequeathed us inimitable models'. Although he considered them to lack aesthetic value, Humboldt did not deem American antiquities to be 'unworthy of attention'. As in Winckelmann's evolutionary scheme, they were valuable as objects of a universal science, for, he wrote, 'they offer to our eyes a picture of the uniform and progressive march of the human spirit'.

For Humboldt, the style of American antiquities came closest to that of the ancient Egyptians and, to some extent, to that of Mongols and Tartars. This was not simply because preconquest antiquities resembled morphologically the antiquities of ancient Egypt or China. More importantly, it was the political and religious structures expressed in preconquest antiquities that justified their being placed together with those of Egypt and the Orient. Collectively, preconquest vestiges functioned as an index of the stage of civilisation reached by America's ancient peoples, comparable to the stage reached by the ancient Egyptians. Throughout his writings, Humboldt abstained from concluding that Mexico would have been an Egyptian or an Asian colony in the New World. For him, analogy did not mean provenance. Rather, he used analogies – of style, calendar systems or mythological, religious and political structures – to construct an evolutionary scheme for the history of mankind. Resemblances might have been vestiges of a common 'Asian' origin of New World civilisations, but Humboldt placed that origin very far back in time.

Many of his contemporaries, however, were distrustful of or uncomfortable with the idea that anyone, short of Aryan races, could have constructed complex civilisations or produced sophisticated objects. Turning to putative skeletal and linguistic proof, they feverishly bolstered theories of Old World colonies in the Americas in the past, while making the case that Americans (south of the US border) still needed the guidance of European powers and, increasingly, the United States, if they were to succeed in the present. By the mid 19th century, style was being wielded as justification for a new round of imperialism in Africa and Asia and of neocolonialism in the Americas.

Against such European and US cultural and political claims on Mexico's past and present, some Mexican intellectuals took charge of preconquest antiquities to argue for their autochthonous quality. José Fernando Ramírez was one of the most vocal of them: as director of the National Museum of Mexico in the mid 19th century, he firmly maintained that Mexico's ancient past belonged to Mexico both materially and intellectually. In the context of the French Intervention (1863–5), Ramírez was instrumental in impeding the expatriation of the national collection to the Louvre. He was also one of a handful of Mexican politicians and intellectuals to travel east across the Atlantic. There, he visited some of Europe's most celebrated museums, including the British Museum, the Louvre, the princely collections in Berlin and the superb museum of Egyptian antiquities in Torino, and could therefore compare first-hand the antiquities of the Old World with those of the New. Upon his return to Mexico, he complained that 'those who do not want to grant America's unfortunate son any original thought explain the pyramids as an imitation of Egypt'.[4] For the rest of his life Ramírez

[4] J. Fernando Ramírez, 'Noticias históricas y estadísticas de Durango', *Boletín de la Sociedad de Geografía y Estadística,* 5 (1857), 10.

remained a staunch and mordant critic of all theories of Aryan colonies in the Americas and called for more locally sensitive approaches to the study of Mexico's past, which would bring into play codices, chronicles, indigenous languages and toponymics. In time, Humboldt's 'Aztec priestess' would come to be identified with Chalchiuhtlicue, goddess of water, or with Xilonen, goddess of young corn. Both goddesses were typically represented with headdresses made of folded paper and decorated with amaranth seeds, but Xilonen was painted red, while Chalchiuhtlicue was blue. Humboldt's 'Aztec priestess', now in the British Museum, still shows faint traces of red paint.

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MACHU PICCHU

Amy Cox Hall

Almost everyone has seen it. Featured in millions of nearly identical images gracing glossy travel brochures, Peruvian marketing campaigns and personal posts that are presented as proof of the promise or consummation of adventure or national pride, Machu Picchu's poster-like image is everywhere. First photographed by Hiram Bingham, a historian from Yale University, in 1911 and then by such Peruvian photographers as Martín Chambi and Juan Figueroa Aznar, today over a million tourists take its snapshot each year. The ubiquity of the image of Machu Picchu means that the archaeological remains of the retreat of the ninth Sapa Inca Pachacuti, who ruled from 1438 to 1471, no longer need a caption. Mention Machu Picchu to people and they immediately picture it: a jutting rock spire prominently presiding over a floor of ruins. While there are of course other views available of the site, the one we are most familiar with is the one first displayed in the pages of *National Geographic* in their 1913 'In the Wonderland of Peru' issue.

Hiram Bingham organised three separate expeditions to Peru between 1911 and 1915. The first was planned around four goals, chief among which was to search for archaeological ruins in the Vilcabamba valley. At that time, other explorers, writers and geographers had speculated about the location of the last or 'lost' city of the Incas, where Manco Inca Yupanqui, the last Inca sovereign, had taken refuge from the Spanish conquerors and rival native elites. Many suggested that this last Inca city might be Choquequirao.

Following a visit to Santiago, Chile, in 1908 to attend the first Pan-American Scientific Congress, Bingham retraced a historic trade route between Lima, Potosí and Buenos Aires. Along the way, he visited the ruins at Choquequirao. In *Across South America*, Bingham observed that although the Italian-Peruvian geographer Antonio Raimondi might be correct to argue that Choquequirao was indeed the lost city, additional proof was needed.[1] It was necessary to explore the region of Vilcabamba.

Although Bingham dispelled the 'lost city' myth in one of his earliest publications following the 1911 expedition, this inconvenient finding did not hinder the narrative of Machu Picchu as a lost city from circulating wildly. Indeed, the thrill of potentially discovering a lost city helped garner monetary support in the US and local favour in Peru. *National Geographic Magazine*, newspapers and exhibitions perpetuated the profitable myth with headlines and stories accompanied by photographs.

[1] H. Bingham, (1911) *Across South America: An Account of a Journey from Buenos Aires to Lima by Way of Potosí* (New York, NY: Houghton Mifflin).

Depictions of Machu Picchu in Peru differed somewhat. From the 1920s through the 1950s, photographers such as Martín Chambi and the Cabrera brothers made remarkably similar views to Bingham's. But these photographs captured scenes from Andean life, including the presence of adventuring tour groups in and around the ruins. Although their photographs similarly highlighted loss and mystery, they reframed the ruins through the lens of nationalism and a celebratory nativism or *indigenismo.* Later, these sensibilities shifted as transnational interest in the region grew and Machu Picchu became a symbol of hemispheric unification and pan-American politics. In 1983 Machu Picchu and the city of Cusco were named UNESCO World Heritage sites, ushering in a new era of global tourism.

Recent archaeological and ethnohistorical research suggests that Machu Picchu was a community comprising approximately 600 inhabitants. Along with Incan royalty, artisans and servants from around the Andes resided there, occupied in farming, cooking, weaving and making metal objects. Today, tourists from around the world visit Machu Picchu, weaving their own narratives of discovery and adventure.

Although the many workers and assistants who accompanied Bingham on the expeditions varied, cameras were his constant companions. Kodak sponsored all three expeditions, providing photographic equipment, film, developing materials and instructions. Like so many expedition leaders at that time, Bingham felt that photography was a critical documentary tool for gathering scientific data. Kodak was interested in testing new equipment and securing exotic pictures for advertising purposes.

In addition to providing camera instruments, Kodak printed the photographs at a reduced cost, compiling albums that could then be used as research tools. These albums contributed to the development of theories about the landscape and its people. They were also used to illustrate articles published in scientific journals and magazines. Eventually, 23 albums were made of the approximately 9,000 printed photographs. Bingham kept a set of the albums at Yale and another set was given to *National Geographic*, where the editor, Gilbert Grosvenor, selected images for publication in one of the three issues the society printed featuring stories about the Yale Peruvian Expeditions. That Kodak printed all the negatives for Bingham was not unusual. What was unusual, however, was that they returned them all. Eventually Bingham delivered the negatives to *National Geographic* for safekeeping. Sometime in the 1970s, the original nitrate negatives were destroyed for fear of spontaneous combustion and copy negatives were made.

On the first Yale Peruvian Expedition, Bingham chose fairly portable cameras including a No. 3A special Kodak, two No. 3A folding pocket Kodaks and a No. 4 Kodak. He also packed three tank developers and chemicals for more than 2,500 exposures. The 3A folding pocket Kodak, first introduced in 1903, was unique at that time because it used a postcard format, producing a 3 ¼ × 5 ½ inch image that could be printed on postcard stock for mailing. Bingham's original photographic outfit was also remarkably similar to that of Robert E. Peary, who also carried a No.4 and folding Kodaks on his expeditions to reach the North Pole. For the second expedition, from May to November 1912, Bingham decided that in addition to bringing eight of the tested models from the 1911 expedition, he wanted a No. 4 Panoram camera. He also requested 1,000 more exposures, as the team had run out of film on the previous expedition. For the last Yale Peruvian Expedition, Bingham chose to vary his photographic outfit, selecting a Cirkut camera. This decision proved questionable, since he found the mechanism so finicky that he wrote George Eastman several personal letters complaining about its performance and urging him to never give such a 'carelessly made' camera to another explorer again. Ironically, the Cirkut camera, first released in 1910, was considered the more expensive and superior design and was subsequently manufactured and sold by Eastman Kodak for nearly 50 years. In contrast to exposing stationary film through a pivoting lens, as with the Panoram mechanism, in the Cirkut camera the film rolled past a stable lens that opened as the camera swivelled. The expensive machine was capable of producing a panoramic photograph of up to ten inches in height by 12 feet in length. In the end, the No. 4 Panoram camera seemed to be just right for Bingham, producing some of his most captivating photographs. Through its lens, faraway horizons could be pictured.

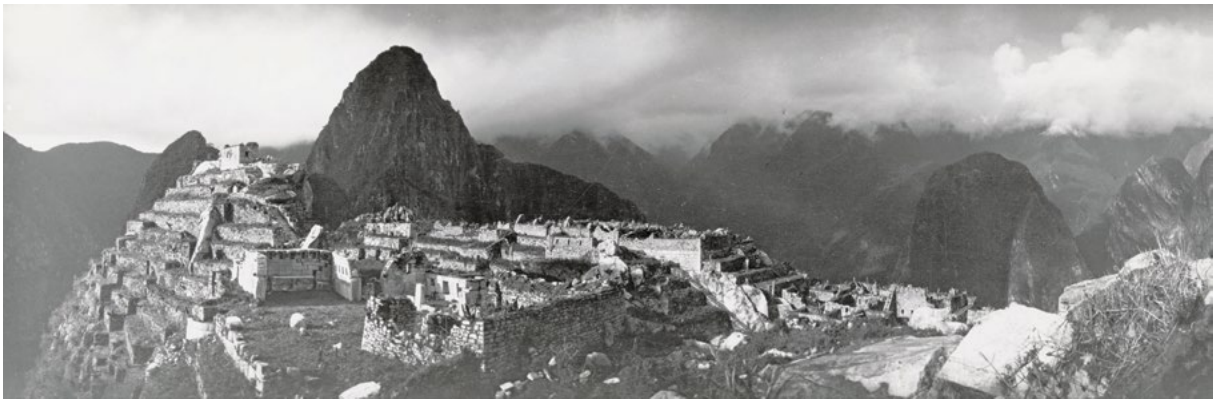

Figure 1. The Ruins of the Ancient Inca Capital, Machu Picchu, *Hiram Bingham, 1912 (courtesy of the National Geographic Society).*

When Bingham first visited Machu Picchu and took its picture, he really did not know what he had seen. He arrived on 24 July, escorted by a boy whom he had paid to guide him. In his field journal, he noted the presence of families who made their homes amidst the ruins. He also remarked on the signatures of previous adventurers, written on the rocks. Having learned about the site from those who inhabited the area, Bingham stayed only for the day, visiting again in September for a few days more. Upon returning to the United States, he secured sponsorship from *National Geographic* and additional funding for two more expeditions. In July 1912, Bingham sailed back to Peru, staying for a month at Machu Picchu. In November, he returned to the ruins yet again. George Eaton, the expedition's osteologist, also stayed at Machu Picchu that summer, organising a widespread collecting operation involving local assistants who helped find and collect much of what was eventually removed from the site. Still, as Bingham told Gilbert Grosvenor, it was not until the publication of the 1913 *National Geographic* issue 'In the Wonderland of Peru' that he realised the magnitude and potential interest of what he had photographed.

Initially, at least, Bingham and his team were not expert photographers. They had difficulty using the new machines. To compensate for their lack of know-how, Bingham provided expedition circulars for team members. The circular contained instructions on the type of scenes desired, how to develop the film and how to document details that would assist in hand-painting photographic slides for illustrated lectures at home. Bingham offered specifics on labelling the negatives, including adding the serial number of the exposure as well as the month, day and initials of the photographer so that the photographs might be systematically catalogued upon the expedition's return from the field. This coding system was useful for managing the enormous quantity of images and ultimately helped organise the photographs into albums, sorted by photographer and in chronological order. With each subsequent expedition, Bingham expanded the information contained in the circulars, suggesting that making pictures was not only a critical expeditionary activity but a challenging technical task as well.

Taking photographs, let alone processing the negatives, was difficult work. Even though many exposures were lost or unsuccessful, developing the negatives in the field, although not necessary, was desirable so that the team members could verify that what they had sought in an image had actually been captured by the camera. Climbing mountains with the camera equipment, levelling tripods, waiting for good light and better weather and hauling water to develop the film meant that much time and effort was spent on making photographs. For such an outlay of effort, there were no guarantees that the photographs obtained would be worthy to be used as scientific evidence. Consequently, Bingham took every precaution to make sure that the members of his team did not waste the precious film on useless snapshots.

Contrary to what might be assumed, photography was not a new technology in Peru. In 1842, Maximiliano Danti brought the daguerreotype to Lima. Daguerre himself had only revealed the machine to the French Academy of Science in 1839. Photographers such as the Courret brothers established successful portrait studios in cosmopolitan Lima in the late 1800s. By the turn of the century, portraiture was thriving in the capital with 40 to 50 studios producing photographs for the well-to-do. By the time of Bingham's arrival in Cusco, photography was established in studios where middle- and upper-class families sought portraits. Camera stores also advertised their wares in daily newspapers.

Even though Bingham organised the expeditions, wrote solicitation letters for sponsorship, coordinated the teams and took many of the photographs we now celebrate, *National Geographic* editor Gilbert Grosvenor perhaps deserves credit for making Machu Picchu a household name and its image a common sight. Profusely illustrated with 244 pictures, 'In the Wonderland of Peru' was dedicated to Bingham and the Yale expeditions. Of particular note was the specially printed, hand-folded panorama photograph included in each issue of the edition. Grosvenor hoped the image, which cost about $2,000 to print, would be impressive and exciting for the reader. Indeed it was. The foldout image was almost immediately reprinted and circulated in newspaper and magazine copy in the United States and abroad.

In *Lost City of the Incas*, Bingham wrote, 'Would anyone believe what I had found? Fortunately, in this land where accuracy in reporting what one has seen is not a prevailing characteristic of travellers, I had a good camera and the sun was shining.'[2] But of course, Bingham was only able to photograph Machu Picchu because it was already known. And the picture that would make him, and it, so famous was actually taken in 1912, not in 1911 when he first viewed the site. Although today we often think of a photograph as the result of one person's decision to click a screen or open and close a shutter, the making of this iconic New World image-object was the eventual result of a specific configuration in time and space of machine, labour, subjects, camera technology, climate, corporate sponsorship, mass media and desire.

Bingham's, or rather *National Geographic*'s, panoramic view persists today in millions upon millions of printed and digital photographic images. For the centenary celebration of the 1911 expedition, an enlargement of the panorama was featured in an exhibition titled *Machu Picchu 100 años: una mirada a la expedicíon que asombró al mundo* held at the Sumaq Machu Picchu Hotel in Aguas Calientes, Peru, a town at the base of the massif that supports the ruins. The same panorama was included in *National Geographic*'s exhibition *Machu Picchu: A Lost City Uncovered; Photographs from the Hiram Bingham Expeditions 1911–1915*, which ran for three months in 2011 at the National Geographic Museum in Washington, DC. Jonathan Irish, a photographer and program director at National Geographic Adventures, did a project in 2013 called Then + Now re-photographing some of Bingham's images of the site, including the storied panorama. Every so often, *National Geographic* writes another news piece about Bingham and his photography, using expeditionary images to illustrate the text. On 24 July 2017, one such story appeared highlighting some of Bingham's famed panoramas through a slideshow that included the original foldout. Today, anyone with access to the Internet can view the reproduced panorama on the National Geographic website.

Although Bingham's first photograph documented Machu Picchu in greyscale, today we are most familiar with images showing its glorious green grassy expanses and breathtaking blue sky. Eastman Kodak Company had a hand in this, too. In 1939, Kodak began to promote the accessibility and potential of amateur colour photography. What began as a Kodachrome slideshow called *The Cavalcade of Color* at New York City's World's Fair became one of Kodak's most unique and enduring marketing campaigns. Beginning in 1950, Kodak installed massive 18 × 60 foot backlit transparencies, themselves comprising 41 separate sections, known as Coloramas, in New York City's Grand Central Terminal. Over the next 40 years, 565 transparencies were installed in the terminal, with the aim of promoting colour photography to a mass audience. Mostly taken by Kodak staff photographers, the

[2] H. Bingham, (1952) *The Lost City of the Incas: The Story of Machu Picchu and Its Builders* (London: Weidenfeld and Nicolson), 186.

images evoked snapshots that the casual photographer might attempt. Along with Norman Rockwell-esque depictions of Americana, including football games, Vermont ski trips and the Rockettes, global tourist destinations were also featured. Machu Picchu graced the terminal's hall at least twice. The first time was in 1964 and featured two tourists. Using the iconic shot of the mountain Huayna Picchu that rises above Machu Picchu, the site is vacant except for a couple seated on a rock, looking away from both the camera and the ruins. The second was in 1977. This time, the angle of shot is slightly different, taken from a higher point on a knoll, looking down towards the ruins. Still framed by Huayna Picchu, this Colorama featured a shepherd with his four llamas.

In addition to inventing roll film, providing cameras and film free of charge to the three Yale Peruvian Expeditions, compiling the albums that were foundational for subsequent research and bringing colour to its rocky knolls for all to enjoy, Kodak's technological advances have been instrumental in Machu Picchu's continued global circulation. In 1978, Kodak patented the electronic still camera, the world's first digital camera. In 1989, Kodak released the first single-lens reflex digital camera with a 1.2 megapixel sensor and a memory card. Although Kodak eventually went bankrupt precisely because of the explosion of digital photography, digitisation has enhanced the reach not only of Bingham's original photographs of Machu Picchu but of countless similar others as well. As of August 2020, #machupicchu had over 1.7 million posts on Instagram, each including a photograph. Such widespread and unfettered circulation has meant that Bingham's photograph of Machu Picchu continues to be taken today, not by him but by us. As for the original 1913 'In the Wonderland' *National Geographic* issue with the special panoramic foldout, it has become a collector's item.

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Part 2

NATURALIA

AMAZON

Roberto Chauca

Our current vision of the Amazon River was pioneered by Samuel Fritz. A member of the Society of Jesus, he left his native Bohemia – today's Czechia — for South America in 1686 and remained in the Jesuit province of Quito, today's Ecuador, until 1725. Fritz is perhaps best known for authoring a map of the Amazon River, engraved in Quito in 1707 (Figure 1). To understand the pioneering role that Fritz's 1707 Quito map played in the establishment of our current vision of the river's course, we must review the earlier views of cartographers, geographers and chroniclers, most of whom were based in Europe.

In his *Descripción de las Indias Occidentales*, the chief chronicler of the Indies, Antonio de Herrera y Tordesillas, noted that the headwaters of the River Plate consisted of many rivers running south from the great Lake Xarayes, ostensibly located in the South American interior.[1] Interestingly, this lake also received fluvial waters from the eastern flanks of the Andes, mainly from the regions of Charcas and Cusco, which were in turn tributaries of the Amazon River. These latter rivers did not run south but north, however, creating the perception that the River Plate and the Amazon were connected through the headwaters at a certain Lake Xarayes. The cartographic consequences of this fluvial connection were depictions of the Amazon as running in a longitudinal manner. The north–south orientation graced several 17th-century maps by some of the most recognised cartographers in Europe. It is seen, for instance, in Joannes de Laet's *Paraguay, o Provincia de Río de la Plata*, Henricus Hondius's *Americae Pars Meridionalis* (Figure 2), Nicolas Sanson d'Abbeville's *Amerique Meridionale* (Figure 3) and Willem Bleau's *Americae Nova Tabula*.[2]

The cartographic delineation of the Amazon River in a longitudinal or north–south orientation was the foundation of what we know today as the Brazil-as-an-island concept. In this view, the large, mythical Lake Xarayes, ostensibly located in the middle of the South American continent, served as a point of connection with the River Plate, which flowed southwards, and the Amazon, which ran north. Brazil was thus represented as a de facto island, separated from the rest of the continent by these two rivers conjoined by the lake. More problematic, in geopolitical terms, was the convergence of this riverine, longitudinal delineation with the line dividing the Iberian empires according to the 1494 Treaty of Tordesillas. The implication was that both crowns could exert dominion along the

[1] A. de Herrera y Tordesillas, *Descripción de las Indias Occidentales* (Madrid, 1601).

[2] J. de Laet, *Paraguay, o Provincia de Río de la Plata* (Leiden, 1633); H. Hondius, *Americae Pars Meridionalis* (Amsterdam, 1638); N. Sanson d'Abbeville, *Amerique Meridionale* (Paris, 1650); W. Bleau, *Americae Nova Tabula* (Amsterdam, 1665).

Figure 1. S. Fritz, 'The Marañon or Amazon River, with the Jesuit Mission', 1707 (courtesy of the Archivo del Ministerio de Relaciones Exteriores de Ecuador).

entire Amazon and River Plate, since the rivers constituted the very line dividing the Portuguese and Spanish realms in South America. As a result, the maps of South America produced by some of the most renowned 17th-century cartographers had to be contested from the Spanish side, since this delineation gave practically a free pass to Portuguese and other potential Atlantic powers to navigate upriver towards the sources of the Amazon and River Plate to the Viceroyalty of Peru, including its most precious resource, namely the silver mines of Potosí.

The most important agents of Hispanic empire in Amazonian South America at the time were the friars of the Society of Jesus. Jesuit missionary presence became solidified here after the expedition led by the Portuguese captain Pedro Teixeira in 1637. One of the members of the expedition was Cristóbal de Acuña, former director of the Jesuit College of Cuenca in the Audiencia of Quito. After the conclusion of Teixeira's expedition, Acuña continued his journey across the Atlantic, presenting a report to the king of Spain and the Indies, subsequently published as *Nuevo descubrimiento del gran río de las Amazonas*.[3] This account became an immediate bestseller. By the end of the 17th century it had been translated into French and English and re-edited in Spanish. This success made Acuña one of the leading authorities in Amazonian affairs in terms of knowledge about its

3 C. de Acuña, *Nuevo descubrimiento del gran río de las Amazonas* (Madrid, 1641).

Figure 2. H. Hondius, Americae Pars Meridionale, *1638 (courtesy of the Norman B. Leventhal Map & Education Center at the Boston Public Library).*

geographical characteristics, indigenous inhabitants and natural resources.

Although Acuña's account did not include maps, there is a contemporaneous manuscript chart of the Amazon that expresses his description of the river (Figure 4). This chart was included at the end of the 1639 anonymous manuscript *Descubrimiento del río de las Amazonas y sus dilatadas provincias*, held at the National Library of Spain in Madrid. The manuscript – whose authorship is credited either to Alonso de Rojas, then-director of the Jesuit College of Quito, or Acuña himself – describes Teixeira's expedition as well. It portrays the Amazon with a peculiar longitudinal orientation, with the city of Quito at the top of the map as the headwaters of the river. This map is focused on the course of the Amazon, depicting the route followed by the Teixeira expedition that connected the city of Quito with the cities of Belém and São Luis. Though this map does not make any connection between the hydrographic basins of the Amazon and the Río de la Plata, its vertical orientation resembled the riverine delineation characteristic of the Brazil-as-an-island maps made in Europe. The chart lent support to the development and advancement of Portuguese Jesuit

Figure 3. N. Sanson d'Abbeville, Amerique Meridionale, *1650 (courtesy of the British Library).*

missionary activity along the course of the Amazon. Such was also the case of Simão de Vasconcellos and his *Chronica da Companhia de Jesu do estado do Brasil*.[4] Vasconcellos argued that the Plate and Amazon rivers were like two silver keys that locked up the land of Brazil or, more graphically, two giants defending and demarcating the line dividing the Portuguese and Spanish realms in South America. The implications of this description were that there was not a Spanish nor a Portuguese Amazon but rather a joint and shared jurisdiction over the river.

A few decades later, a more decisive cartographic response from the Spanish side reversed the longitudinal depiction of the Amazon to establish once and for all the now-conventional latitudinal vision of the river. As an object of knowledge, scholars have praised Fritz's map for its detailed ethnographic and scientific information and, interestingly, as one of the silenced sources of the Frenchman Charles-Marie de la Condamine, head of the scientific exploration to the Amazon River and author of a map and travel account of the region, *Relation abrégée d'un voyage fait dans l'intérieur del'Amérique méridionale*.[5] An unattended aspect of Fritz's map, however, was its objective to amend European and specifically Portuguese longitudinal representations of the Amazon with a view that privileged its Peruvian headwaters.

[4] S. de Vasconcellos, *Chronica da Companhia de Jesu do estado do Brasil* (Lisbon, 1663).

[5] C.M. de la Condamine, *Relation abrégée d'un voyage fait dans l'intérieur del'Amérique méridionale* (Paris, 1745).

Figure 4. Anonymous, Mapa del río Amazonas y su cuenca, *in Martín de Saavedra,* Descubrimiento del Río Amazonas y sus dilatadas provincias, *1639 (courtesy of the Biblioteca Nacional de España).*

Unlike Acuña's description and the Brazil-as-an-island maps of South America, Fritz's Amazon assumes a latitudinal or horizontal orientation. This representation, then in need of a stronger foundation, was reinforced by suggesting a new source for the river. At the beginning of the note attached in the lower right hand corner of Fritz's 1707 map, it is stated: 'This famous River, the greatest that has been discovered, that bears the name sometimes of Amazons, sometimes of Orellana, is properly the Marañon, a name that the majority of cosmographers give to it from its sources and all the provinces of its upper course. It springs from the lake Lauricocha close to the city of Guánuco in the Kingdom of Peru.'[6] This emphasis on the proper headwaters of the river may seem superfluous to present-day eyes, but it was a decisive challenge to the conventional longitudinal representation of the Amazon river. First, Fritz's map took aim at Acuña's *Nuevo descubrimiento*. That account had located the headwaters of the river near the city of Quito. Second, and most important, Fritz's map sought to debunk the notion that the river originated in Lake Xarayes, a geographical vision that was still held and defended by Portuguese authorities.

After a series of circumstances in the middle Amazonian missions under his observance, in 1689 Fritz navigated down the Amazon to seek shelter in the city of Belém. He returned to Quito in 1691. During these two years, he stayed at the local Portuguese Jesuit College of Pará, where he had the opportunity to discuss and chart the Iberian possessions along the Amazon with local officials, in particular the governor of Pará, Antônio de Albuquerque. In these deliberations, Fritz defended his right to missionise in the middle Amazon by showing Albuquerque an early manuscript version of his 1707 engraved map. Meanwhile, the governor deployed the Brazil-as-an-island argument to defend the Portuguese right of possession over the Amazon by showing Fritz a world map made by Aloïs Konrad Pfeil, Jesuit cartographer and astronomer at the College of Pará.

This Spanish–Portuguese debate among Jesuits at Belém suggests that the longitudinal representation

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6 S. Fritz, *El gran río Marañón, o Amazonas con la misión de la Compañía de Jesús* (Quito, 1707).

of the Amazon was problematic for the very existence of the Spanish Jesuit missions in the region. The issue persisted until 1702, when Fritz prepared a report complaining of Portuguese incursions into his middle Amazonian missions. Against the Lusitanian arguments, Fritz noted that the Amazon River 'from its mouth westward, turns neither northward nor southward completely, instead it always runs following the equinoctial line'.[7] In 1707, when Fritz, now superior father of the Jesuit missions of the province of Quito, had the necessary resources to have his map of the river engraved, the 'equinoctial' orientation of the Amazon river would be famously established. The convention continues to shape our view of the river today.

7 S. Fritz, 'Declaracion del Padre Samuel de la Compañía de Jesus missionero de la Corona de Castilla, en este rio Marañon ó Amazonas, sobre su Mission de Omaguas, Yurimauas, Aiçuares y Ybanomas tocante á la Corona de Castilla', Pueblo de Ybanomas, 4 June 1702. Archivo de la Compañía de Jesús de Quito, leg. 8, doc. 705, f. 1r.

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BIRD OF PARADISE

José Ramón Marcaida

It is often said that the first (dead) specimens of the bird of paradise arrived in Europe in 1522 along with the surviving members of the Magellan–Elcano expedition, which had just completed the first circumnavigation of the world. While we know that this bird – native of New Guinea and the Moluccas archipelago – had been known to Europeans for some time before this date, in the early decades of the 16th century the bird of paradise was considered a novelty, a rarity. Moreover, travellers' accounts and manipulated specimens soon gave rise to the legend that the bird lacked feet and thus spent its lifetime aloft, in permanent flight. This feature, which challenged the long-held Aristotelian view that all birds should have feet, turned the bird of paradise into a natural marvel of the kind collected and displayed in cabinets of curiosities and elaborate headdresses.

One of the earliest and most remarkable descriptions of the bird appears in the revised and expanded version of the first part of the *General and Natural History of the Indies* of Gonzalo Fernández de Oviedo (1478–1557).[1] Oviedo's description of this most 'notable, singular and admirable bird' ('*una ave ó páxaro extremado y mucho cosa de ver*') consumes an entire chapter. Oviedo opens the chapter with a brief account of his personal encounter with the dead bird in Hispaniola, where he had the opportunity to converse with the explorers Andrés de Urdaneta and Martín de Islares. In the course of that conversation, Urdaneta presented him with a prestigious and rare gift from the East Indies: a panache of feathers ('*un plumaje o penacho*') of a bird which neither Urdaneta nor Islares could name. Oviedo begins his account of this bird skin by noting his inability to describe its beauty with words. Its feathers were the finest he had ever seen. It was an object so beautiful, he writes, that it must be seen rather than described in words. 'Of all the things I have seen, this is the one that has left me with the least hope of ever making it known with my words.' To be sure, Oviedo's words conform to the rhetorical practices of his age, when the trope of the inadequacy of words, associated with the wondrous or sublime, secured the privileged, knowing position of the eyewitness and narrator.

Despite the professed insufficiency of words, Oviedo proceeds to provide an exhaustive written description of the bird in his possession. First, by focusing on features like the size of its body and head and the form of its beak, Oviedo establishes comparisons with more familiar European birds. This, too, was a common rhetorical strategy when dealing with previously unknown natural objects. On the hugely contested issue of the bird's feet, Oviedo states that

1 G. Fernández de Oviedo, *Historia general y natural de las Indias y tierra-firme del Mar Océano*, edited by J. Amador de los Ríos (Madrid: Imprenta de la Real Academia de la Historia, 1851), vol. 1.

the bird does not seem to have any, although he admits to having felt with his fingers two little stumps where the feet should have been. Unsurprisingly, most of Oviedo's description is devoted to the bird's feathers. These are discussed in terms of their position on the bird's body, their size and shape, texture and arrangement and, most importantly, their colours. Oviedo is particularly intrigued by two feathers situated at the top of the bird's tail. Each of them is like 'a thick pin' that at the end tapers 'like thread'. When touched, they are 'jagged like a saw'. These feathers would inspire speculation about the creature's comportment, including the notion that the feathers were used to hang from branches of trees.

Oviedo's description of the bird is followed by a reflection on the challenges of capturing in words and images the true qualities of such wonderful natural objects as this. Given its unique characteristics, its colour and the texture of its feathers, he concludes, 'no painter would be capable of painting it'. Near the end of the chapter, Oviedo reflects on the ornamental use of the bird of paradise and its association with majesty and power. He notes Urdaneta's account of the social and commercial value of the bird for Moluccans, among whom it was regarded as 'a rare and precious commodity'. Indeed, worn as a headdress the bird was a symbol of prestige for Moluccan elites. Oviedo suggests that the Holy Roman emperor, Charles V, would do well to wear one of these birds as a symbol of his magnificence and power. He illustrates this point by evoking a series of printed portraits of the Ottoman sultan Süleyman I that feature a bird-of-paradise headpiece. This reference attests to the richness of Oviedo's visual literacy and more importantly to the geographical range of the bird both as an object of knowledge and as a motif of power. Finally, Oviedo informs us that he gave his bird skin to a friend who then departed for Peru. 'Thus, it can be said that, after death, this bird walked, flew and sailed more than he ever did when alive.'

Though Oviedo's description of the bird of paradise was never published in his lifetime, it resonates with later Iberian natural historical accounts, primarily focused on America, which also highlight the bird's mobility and circulation. Thus, Francisco López de Gómara (*c.*1511–*c.*1566), in his *General History of the Indies* (1553), provides a brief account of this bird, whose legs he describes as a handspan long.[2] Interestingly, this statement would have contradicted the legend of the footless bird of paradise and corroborated the information provided by Antonio Pigafetta (*c.*1491–*c.*1531), a surviving member of the Magellan–Elcano expedition, in his travel journal (1519–22, later published under the title *The First Voyage around the World*), where he describes the birds in their possession as having legs.[3] The physician Francisco Hernández (1514–87), the leader of a seven-year-long state-sponsored scientific expedition to New Spain (1570–7), also describes the (footless) bird of paradise in his manuscript account of New Spain's natural history and medical knowledge. Hernández's description would be disseminated via later translations and editions of his texts, including treatises published in Mexico City (Francisco Ximénez, 1615), Antwerp (Juan Eusebio Nieremberg, 1635) and Rome (Accademia dei Lincei, 1648–51).[4] Lastly, in his *Natural and Moral History of the Indies* (1590), the Jesuit scholar José de Acosta (1540–1600) also refers briefly to the bird of paradise, which he describes as being 'brought from China' and 'lacking feet'.[5]

To return to Oviedo's account, his description testifies to the bird's status as a global *perpetuum mobile* of trade, prestige and knowledge. In this sense, the arrival of the birds of paradise in Europe with the surviving members of the first expedition to circumnavigate the world is a fitting landmark for the dawn of the global age.

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2 F. López de Gómara, *Historia general de las Indias* (Zaragoza: Agustín Millán, 1553).

3 A. Pigafetta, *The First Voyage around the World, 1519-1522: An Account of Magellan's Expedition*, T.J. Cachey, ed. (Toronto: University of Toronto Press, 2007).

4 F. Ximénez, *Quatro libros de la naturaleza y virtudes de las plantas y animales que estan recevidos en el uso de la medicina en la Nueva España* (Mexico City: Widow of Diego López Dávalos, 1615); J.E. Nieremberg, *Historia naturae, maxime peregrinae* (Antwerp: Plantin-Moretus Press, 1635); F. Hernández, *Rerum medicarum Novae Hispaniae thesaurus* (Rome: Vitale Mascardi, 1651).

5 J. de Acosta, *Historia natural y moral de las Indias* (Seville: Juan de León, 1590).

Figure 1. Manucodiata *or bird of paradise. In J.E. Nieremberg,* Historia naturae, maxime peregrinae *(Antwerp: Plantin-Moretus Press, 1635).*

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EMERALDS

Kris Lane

Figure 1. Mughal emerald amulet (courtesy of the al-Sabah Collection, Kuwait).

What do you give the empress or prince who has everything? At one time, just a few centuries ago, emeralds were a good choice, particularly if that prince or empress ruled over an Islamic kingdom or empire. Green, after all, is the colour of the Prophet and of Paradise, and intimate connections to both could be advertised in the form of turban ornaments, rosaries, rings and amulets (Figure 1). No other precious stone so closely resembles plant life, the chlorophyll promise of eternal renewal.

In early modern times, a fine emerald could be a kind of portable hierophany, as much for Hindus and Christians as for Muslims. Spanish jewellers in the 16th century lovingly described emerald inclusions or peculiar internal flaws as *jardín*, or 'garden', while also referring to the best stones as having 'the colour of heaven' (*laya del cielo*). A fine emerald, one might say, was a fossilised remnant of Eden, a foretaste of the Promised Land. Emerald was also medicine and prophylaxis, protection against poisonous food, snakebite, an enemy's arrows and the evil eye.

Ancient Western and Eastern traditions alike trace emeralds to Old World sources, most notably Egypt. Some were found in parts of South Asia and there was one source in Austria, but such stones tended to be small, inconsistently coloured or cloudy. Emeralds would later be found in Russia, Central Africa and Brazil, but in early modern times the only new source of these peculiar green rocks – hexagonal crystals of aluminium beryllium silicate spiked with chromium – was New Granada, today's Colombia. They caused a global stir once they hit the market after 1540, and despite new finds, Colombia still produces the most prized emeralds in the world, the product of a geological fluke.

Colombia's emerald belt trends northwest to southeast about 100 km north of Bogotá, with the most famous mines located near the towns of Muzo and Chivor (Figure 2). In the rugged hills spilling off either side of the Eastern Cordillera, emeralds ranging in colour from brilliant aqua to deep green are found in tiny, almost random pockets amid enormously thick beds of coal-black shale and buff to grey limestone. In colonial as in pre-Columbian

Figure 2. The Llanos from the emerald mines of Somondoco (today Chivor), Colombia (photo by K. Lane).

Figure 3. Muisca votive objects in cast gold with inset emeralds (courtesy of the Museo de Oro, Bogotá; photo by K. Lane).

times, armies of workers mined emeralds by chipping benches into hillsides and flushing away detritus with water collected above. Mining emeralds was hard and frustrating work, made worse by tropical ailments. It also sped deforestation, erosion and river sedimentation.

Emeralds appear in pre-Columbian gravesites, primarily in Muisca territory around Bogotá's high plain (Figure 3), but they have been discovered in Colombia's hotter southwest, too, in Calima-culture tombs and among the coast-dwelling La Tolita–Tumaco chiefdoms. These emeralds apparently gave rise to the legendary River of Emeralds in Ecuador, where no such stones seem to originate. Emeralds appear not to have gone much further south in the Andes beyond Ecuador before the 16th century, although other green stones esteemed by the Incas and the Chimú tricked the conquistadors. Emeralds from Colombia's unique geological belt also made their way north occasionally, but few got beyond Panama. Relatively small, brittle and not easily carved, most emeralds could not displace the famous jades or jadeites of Guatemala beloved by the Maya and other Mesoamerican peoples.

So, it was only after the 1530s conquest expeditions of Gonzalo Jiménez de Quesada and other invaders of 'the New Kingdom of Granada' that the outside world learned of the finest, largest and greenest emerald crystals ever seen. Conquistadors sent sample stones from the pre-Columbian mines of Somondoco (today Chivor) to Holy Roman Emperor Charles V, and successors sent prime stones from Muzo (discovered in the 1560s) to his son and heir, King Philip II. Royal severance taxes were immediately collected in Santa Fe de Bogotá along with *quintos* of gold, after which traders and lapidaries moved their shiny product to market, near and far. Some emeralds were smuggled out of the continent and others were absorbed into locally fashioned votive objects such as the astonishing Crown of the Andes (Figure 4).

Taxed or deemed contraband, New Granada's emeralds were always stowed among better known commodities such as gold or pearls, sometimes sewn into a priest's robe or a merchant's frock coat for security. In Cartagena, emeralds pooled among New Christian and other global traders, who sent them on to wholesale gem markets in Seville, Lisbon and eventually Amsterdam and London. We know about them thanks to a mix of Inquisition and notary records. Some raw emeralds found their way into European curiosity cabinets (Figures 5 and 6), and a few were fashioned into odd jewels such as the emerald watch found in London's famous Cheapside Hoard (Figure 7).

Gemstones are not like other commodities, and gem traders inadvertently saturated European markets by the end of the 16th century, driving prices downward. This forced emerald handlers to search for new and wealthy customers. By coincidence, it was precisely at this time that Europeans were expanding trade with the Near and Far East, including territories claimed by the Ottoman, Safavid and Mughal Empires. All three were engaged in rapid territorial expansion projects fuelled by gunpowder.

The Portuguese were first to take Colombian emeralds overseas, and it was probably they who introduced some of the world's largest and finest stones to India and Persia via Goa and Hormuz. Emeralds also bounced through the several gem bourses of the Mediterranean (Barcelona, Genoa, Livorno, Venice) to Cairo and Istanbul. Middlemen included New Christian merchant clans of Spanish, Portuguese or Italian birth, but gem traders included Armenians, French Huguenots and before long the North European trading companies, especially the English and Dutch East India Companies. Most emeralds were picked up for transhipment at Lisbon, Seville or Cadiz, but some went directly from the Americas to Antwerp, Amsterdam and London, to be refashioned or shipped onward raw to Asia.

Eastern markets were not easily penetrated, but emeralds had the benefit of appealing to Muslim

Figure 4. The Crown of the Andes, Popayán, Colombia, 17th–18th centuries (courtesy of the Metropolitan Museum of Art, New York).

Figure 5. Habsburg emerald cluster, 16th century (courtesy of the Naturhistorisches Museum, Vienna).

Figure 6. 'Moor' with c.*1581 emerald cluster, 1724; https://skd-online-collection.skd.museum/Details/Index/117440 (courtesy of the Grünes Gewölbe, Dresden).*

Figure 7. Emerald Watch from the Cheapside Hoard (courtesy of the Museum of London).

rulers and high-ranking subjects in the Near East and South Asia. First, there were three rising empires, the Ottomans, Safavids and Mughals, who were all gaining tremendous wealth from conquest and tribute. Second, each of these empires was headed by a sultan, shah or emperor who revelled in the accumulation of material things as well as in commissioning devotional objects, some of them sent to Mecca (most were later returned in the wake of anti-idolatry sentiments).

In the 17th and early 18th centuries particularly, eye-popping emeralds were a perfect fit for an expanding world of court opulence, especially one fuelled by competition not only among the Ottomans, Safavids and Mughals but also among their many lesser tributary kingdoms and resistant neighbours. Gifting created a peculiar sort of market dynamic, as did the great creativity of Persian and South Asian lapidaries. For example, Portuguese or Banyan gem traders in Goa might sell a cache of raw emeralds to an outlying shah who was negotiating with the Mughals, not yet fully subjected but discovering that it might be time to strike a deal. The Mughal emperor – say, Shah Jahan – would then receive a finely carved emerald from a visiting shah or rajah, be careful to praise it and then outdo it with a return gift of cash, jewelled objects and exotic animals (Figure 8). Politics was performed by means of these highly choreographed acts of reciprocity.

Though not all emeralds moved at this high imperial level, large and exceptional stones usually did. Other gifts included emerald rosaries, turban ornaments and studded boxes. The Mughals and Ottomans in particular were fond of both votive objects and emerald-handled daggers. There were emerald ornaments for women in both royal families (Figure 9), but typically emerald was associated with masculine leadership, sometimes rendered in the form of protective amulets inscribed with verses from the Qur'an or with Shi'a prayers, since most artisans were Persians. Such amulets could be sewn into a ceremonial silk jacket, prayer side facing in, carved palm frond or lotus flower side out (Figure 10). Other religious items traded by the Mughals included a remarkable emerald cup, fashioned from a large crystal and inscribed with Persian verses (Figure 11).

Figure 8. Shah Jahan and his emeralds *(courtesy of the Victoria & Albert Museum, London).*

The Topkapı Dagger (Figure 12), named for the famous palace and museum in which it sits, represents another kind of diplomacy. Fashioned in the early 18th century by Ottoman craftsmen, the emerald-studded weapon was meant as a peace offering to the Persian successor of the Safavids, Nadir Shah (Figure 13). A military force of nature whose ambitions prefigured Napoleon's, Nadir Shah had defeated the Mughal ruler and sacked Delhi in 1739, making off with the lion's share of Muhammad Shah's accumulated treasures, including thousands of Colombian emeralds. Many were later incorporated into a jewelled globe to prevent theft (Figure 14).

Figure 9. Lady with a Lotus Petal, c.*1760. Note the emeralds blended with pearls and rubies (courtesy of the Victoria & Albert Museum, London).*

Figure 10. Mughal protective amulet inscribed with Throne Verse (Qur'an 2:255) (courtesy of the al-Sabah Collection, Kuwait).

Figure 11. Mughal inscribed emerald cup (courtesy of the al-Sabah Collection, Kuwait).

Figure 12. The Topkapı Dagger, c.*1746 (courtesy of the Topkapı Palace, Istanbul).*

Figure 13. Persia's Nadir Shah after the 1739 sack of Delhi (courtesy of the Victoria & Albert Museum, London).

The Topkapı Dagger was commissioned for Nadir Shah in 1746, but it appears he was already cursed by Mughal treasure. Obsessed with protecting his hoard and increasingly distrustful of his many subordinates, Nadir Shah lashed out at those whom he might have co-opted. He was assassinated in 1747, just in time for the Ottoman ambassadors carrying the emerald-handled dagger to find out before crossing the Persian frontier, allowing them to return to Istanbul. The Topkapı Dagger, which is also inset with an English watch at the top of the hilt, stands as a mute testament to early modern globalisation. New Granada emeralds were drafted into a special political mission only to be recalled and incorporated into an imperial museum anxious to proclaim its own glories.

Thus, the emeralds of the New World managed to conquer the Old, not just the courts and bourgeois parlours of Europe but also the palaces of the world's richest monarchs, the Islamic emperors of the Near East and South Asia. Some Brahmanic rulers and even some Buddhists used Colombian emeralds in their jewelled and votive objects as well – examples may be found in India, Burma and Thailand – but nothing compared with the great stones of the gunpowder empires. And the Chinese? Well, they had jade.

Figure 14. Jewelled globe with emerald seas (courtesy of the National Bank of Iran, Tehran).

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PEARLS

Jorge Cañizares-Esguerra

Figure 1. Perla de Guatemala, ES.41091.AGI//MP-INGENIOS,139 (courtesy of Archivo General de Indias, Seville, Spain).

The story of pearls is more than meets the eye. It is the story of early modern risk, entrepreneurship, slavery, Carib geopolitical power and piracy. It is also one in which slavery and conversion were closely linked.

This foundational episode in the story of pearls is the story of the Cardona family, who were granted a royal monopoly on them in the early 17th century. The Cardonas repeatedly lost fleets and capital in the pursuit of pearls, wealth, royal grace, sunken treasure, slaves and converts. Tomás de Cardona grew up a page of Philip III, king of Spain, Portugal, Sicily, Naples, Sardinia and Milan and emperor of the Indies. Sometime in 1610, Tomás won the *asiento* (monopoly) for pearl extraction in the Caribbean and California. The asiento also included rights to rescue treasure off shipwrecks in the Caribbean. In 1613, Tomás created a company and with financiers put together a small fleet of six *naos* and caravels. The fleet was led by Tomás's young nephew, Nicolás de Cardona. The fleet sailed from Cadiz, at the southern tip of Spain. It spent almost two years moving around the Caribbean looking for pearls and the shipwrecked fleet of General Luis Fernández de Córdoba.

Once in the Caribbean, however, the fleet spent two months moving along every island in Barlovento, from Granada to Barbados to Guadalupe, and then sailed down along the coast of Tierra Firme, or Venezuela (Figures 2 and 3).

Nicolás's fleet was looking for pearls, but also for captives to *rescue*. Cardona's company needed slave divers to collect both pearls and treasure from shipwrecks. Cardona did not get his slaves from the Portuguese *conversos*, who held the monopoly on the African slave trade from Guinea and Angola. He got his slaves from Caribs, the famed 'cannibals' who since Columbus had gone from island to island staging raids, wreaking havoc and constantly setting limits to and rules for European geopolitical aspirations.

By 1601, the Caribs had turned the many islands of Barlovento into a pirate's nest from which to stage raids on the missions of Paria (Venezuela), where they would capture 'Taíno-Arawak' natives. By raiding plantations and rescuing survivors from shipwrecks, the Caribs also had taken many African slaves. Arawak and African women worked as slaves in Carib cassava, tobacco and brazilwood plantations.

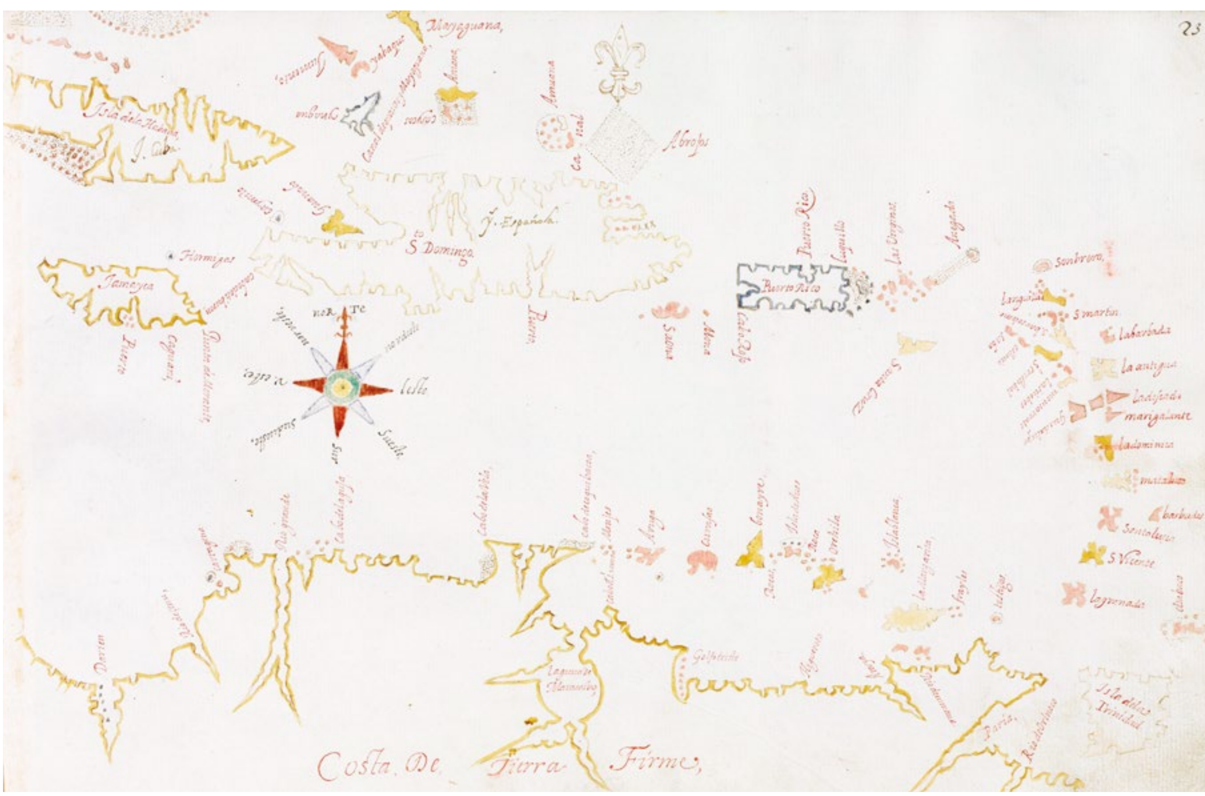


Figure 2. Nicolás de Cardona, Descripciones geográficas e hidrográficas de muchas tierras y mares del norte y sur en las Indias *(courtesy of Biblioteca Nacional de España, manuscript 2468-10).*

Figure 3. Cardona, Descripciones geográficas e hidrográficas.

The Caribs cured tobacco and brazilwood dye, which they traded for axes, machetes, knives and fishhooks from French and Dutch smugglers. The Caribs also sold slaves. In 1613, Cardona encountered a thriving decentralised Carib empire based on plantations and slave raiding. Unlike the Comanches, whose decentralised empire of the 18th and 19th centuries was built on the back of horses and rifles, the Caribs built theirs on piraguas and poisoned arrows.

When Nicolás entered the archipelago of Barlovento, he purchased slaves from the Caribs. In one afternoon in the island of Granada, for example, Cardona purchased two African women whose ears and noses had been cut off. He also purchased two mestizo child slaves whose fathers, French and Dutch sailors, had set up households with Carib women before abandoning the island. Finally, Cardona paid for a skinny mission Arawak Indian who alleged that his better-fed brother had recently been barbecued roast at a Carib gathering. Cardona did not call these transactions 'purchase' but *rescate* or 'rescue', a term laden with heavy religious meaning. Slaves acquired through rescate from idolaters in the Caribbean and Africa were not simply 'purchased', they were rescued into the fold of Christianity to be converted and saved as *criados*. Slavery was conversion. To be sure, it was also labour.

After purchasing two dozen Indians and Africans from the Caribs, Cardona sailed for Veracruz, where he disassembled his fleet for the long and arduous trudge with a cargo of planks, masts, sails, cordage, iron and slaves across mountainous central Mexico. In the Pacific port of Acapulco, Nicolás had three new ships rebuilt. The viceroy of New Spain ordered Cardona to use his crew to build fortifications in Acapulco and to deploy his ships against approaching Dutch pirates. Cardona stayed put in Acapulco for three months. The pirates never materialised. Finally, Nicolás took his fleet to California to collect pearls, taking advantage of the asiento Philip III had granted his uncle Tomás.

Nicolás took his Carib-purchased slave divers to the islands nearby Mazatlán to recover pearls. He also packed his crew with Franciscan friars, carrying them to the Gulf of California to convert the local natives. Cardona spent nine months reconnoitring California, which he mapped as an elongated peninsula, not an island as it was then imagined, rich in silver mines and, he claimed, pliant, convertible Indians (Figure 4). Cardona left two ships behind in Sinaloa charged with returning to California for pearl fishing. He took the third ship back to Acapulco to inform the viceroy and his firm about his discoveries.

Nearing Acapulco, Cardona's ship was attacked by the Dutch privateer George Spilberg. Cardona lost the friars, the slave divers and his ship, although

Figure 4. Cardona, Descripciones geográficas e hidrográficas.

not before jumping off the vessel. From the safety of land, Nicolás helped capture six of the pirates. In the meantime, the governor of Nueva Vizcaya (New Biscay) commandeered Cardona's two-ship Sinaloa fleet to the Philippines to warn Manila authorities of the impending attack by the Dutch, for Spilberg had made clear he intended to capture Ternate and Manila.

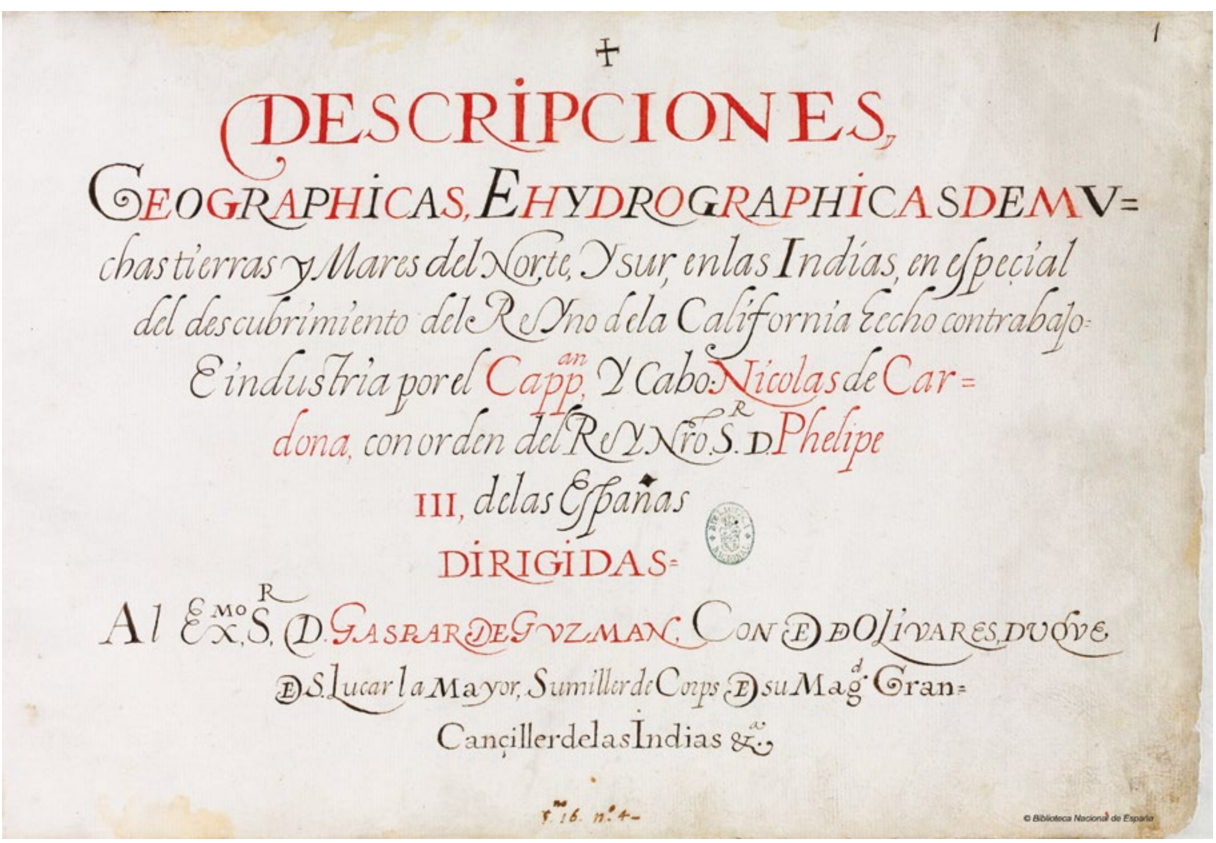
Broke, Cardona returned to Spain in 1617. Once back home, he put together enough fresh capital to start out again. In 1619, Cardona embarked from Cadiz with the armada of Don Lope Díez de Aux de Armendáriz, first marquis of Cadreita, bound for Panama to punish pirates. Once in Darién, Cardona crossed the Isthmus, where he had a fleet of three naos assembled, and recruited a crew of some 100 men, including many slaves for hire. Educated by his previous experience, Cardona this time did not buy slaves from the Caribs but instead 'rented' them from *vecinos* in Panama.

As he was departing for California, news arrived from Peru that Dutch pirates were about to attack the port of Cañete in the Isthmus. The viceroy of Peru, the *principe de Esquilache*, commandeered Cardona's fleet for two months. Cardona paid the salaries of his rented slaves as well as the defence of the port. Again, the pirates did not show up and Cardona was let go. His fleet of three soon became one as one ship went up in flames and another had the hull cracked during a storm. Cardona was to lose the third to a shipwreck when he briefly disembarked near Acapulco to straighten out the paperwork of the family pearl asiento.

Cardona did not shrink from these contretemps. He had two new naos built with financial resources he quickly scraped together in Mexico. This time, however, the viceroy of New Spain, the marquis of Gelves, commanded Cardona to abandon Acapulco immediately and bring the entirety of his crew of rented slave divers with him across the breadth of Mexico and down to the Caribbean port of Veracruz. Ships were waiting there to take Cardona and his 14 divers to the western coast of Cuba, where the marquis of Cadreita, general of the Spanish Armada, had lost two galleons loaded with silver. Cardona and the divers spent several months looking for the sunken treasure. They managed to rescue muskets and munitions, but only a few ingots of silver.

Empty-handed once again, Cardona returned to Spain to help his uncle. Tomás had recently been promoted to *mayordomo* or manager of Philip III's household, and with that post came the asiento on the mercury mines in Andalusia. Nicolás tried to exploit a new mine of mercury in Usagre but to no avail. In 1632, the ever-profitless Nicolás penned a merit report detailing a lifetime of service to the crown, in which he appealed to the monarch for further rewards (Figure 5). His maps and stories of entrepreneurship in the Caribbean and California were part of his petition for grace to the king, which also included a request for a new monopoly on the colonisation of California. His plan included the mobilisation of peoples and missionaries from Sinaloa, who would be attracted by the many promises of untapped silver mines and souls to be saved.

Cardona's career is a window onto the world of both the 16th-century Caribbean and pearl diving. His report-memoir exposes the nature of the enterprise, one in which the Caribs held geopolitical control of European settlements, the slave and pearl trade and emerging plantations. The world of captivity, smuggling and raiding associated with the Caribs suggests that the production of pearls was not solely an activity controlled by Europeans. Instead, the power of the Caribs to set the terms of exchange of captives and indigenous slaves should make us reconsider the early modern Caribbean more as an African coast, and pearls as the product of the indigenous slave trade and the recirculation of African captives by local ethnic groups and leaders.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de S. Lucar la Mayor, Sumiller de Corps de su Mag.d Gran=
Canciller de las Indias &c.

Figure 5. Title page, *Cardona,* Descripciones geográficas e hidrográficas.

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COCHINEAL

Miruna Achim

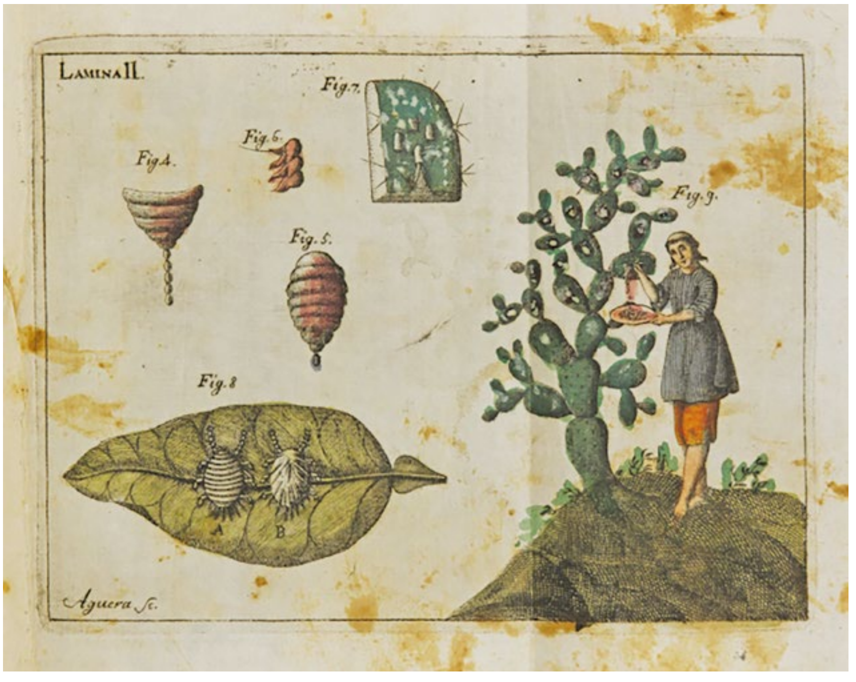

Figure 1. Harvesting cochineal. José Antonio Alzate y Ramírez, 'Memoria sobre la naturaleza, cultivo y beneficio de la grana' [1777], published in the Gazeta de Literatura, *12 May 1794.*

Over the course of three centuries, the cochineal dye, originally from the valleys of Oaxaca in central Mexico, was one of the most expensive and coveted sources of red in the Atlantic and Mediterranean worlds. A deep, intense carmine of great durability, cochineal worked its alchemy to colour the modern era. The choice of red for all luxury textiles, it suffused the state robes of royalty and nobility, military uniforms and folk costumes. The clothes of the Ottoman sultan were steeped in cochineal red, as were the togas of cardinals in Rome. And some of Europe's most famous painters, from Tintoretto to

Titian, from Rembrandt to Van Gogh, used cochineal to signal the dignity and opulence of their sitters and make their canvases flicker with life and fire.

Properly speaking, the dye is the pulverised body of the cochineal insect, *Dactylopius coccus*. The insect produces carminic acid to defend itself against predators and spends most of its life feeding on cacti of the genus *Opuntia*. Fittingly, in Nahuatl, the dye is called *nocheztli*, meaning 'blood of the prickly-pear cactus' (Figure 1). Some of the earliest representations of cochineal appear in the records of tributes imposed by the Mexicas or Aztecs on the peoples of their vast empire (Figure 2). The dye made its first journey across the Atlantic among the gifts sent by Hernán Cortés to Emperor Charles V. By the 17th century, cochineal, a monopoly of the Hispanic monarchy, constituted an extraordinary source of revenue, surpassed only by silver. Like silver, it travelled the route of the Spanish galleon. Stocked in leather pouches, cochineal arrived first in the Spanish harbours of Cadiz and Seville, whence it was traded

Figure 2. Two cochineal bags, filled with red dots, are represented bottom left. Codex Mendoza, *MS Arch. Selden A.1, fol. 43r, c. 1540 (courtesy of Bodleian Library, University of Oxford).*

and distributed to the world's most renowned textile-producing centres, such as Toledo, Segovia, Florence, Milan, Lyon, Amsterdam and Venice, and as far as Cairo and Goa. It was only after the invention of cheap, mass-produced artificial dyes in the mid 19th century that cochineal lost its global relevance.

Given its tremendous commercial potential, it is unsurprising that other European powers, in particular the British and French monarchies and the Indies trade companies, sought to secure a stake in its production and distribution. In his *Voyage to Jamaica*, Hans Sloane, founder of the British Museum, dedicates a few lines to 'this good commodity'. Referencing two of the more popular theories about cochineal, e.g. that it was a worm or a berry (the name *grana cochinilla*, as the dye is still called in Mexico, is a vestige of this belief), Sloane identified the plant on which it grew as '*Opuntia maxima*' (Figure 3). This 'tree' had spread across the island of Jamaica, brought there from the American mainland by a Spanish priest, but cochineal did not.

Figure 3. Hans Sloane, 'The manner of propagating, gathering & curing ye Grana or Cochineel, done by an Indian in the Bishoprick of Guaxaca in the Kingdom of Mexico in America', Voyage to Jamaica, *vol. 2, plate 9, 1725 (courtesy of John Carter Brown Library).*

As Sloane wrote, in Jamaica no one had ever observed 'that Worm upon any of their Trees'. Privateering, not animal husbandry, was the surer way to acquire the dye in Jamaica.[1]

Some decades later, in 1777, French botanist Nicolas-Joseph Thiéry de Menonville risked life and limb to travel through the cochineal-producing valleys of Oaxaca as a spy, on a mission to extract cacti and cochineal and gather the information necessary to reproduce them in the French dominion of Saint-Domingue. For his courage, he earned the title of royal botanist to the French king. But his endeavour to make the *jardin du roi* in Port-au-Prince a growing field for cochineal failed. In the colonial contexts of the modern world, where medicines, plants, animals, books and practices travelled globally, cochineal invites us to think about the limits of circulation and networking. Surely, not all things circulated equally easily; sometimes, not even spying or piracy managed to break secrets or monopolies exerted over certain stuffs. Why?

A reading of the most complete treatise on cochineal offers an answer. The same year Thiéry de Menonville made his way from the port of Veracruz to Oaxaca and back, José Antonio de Alzate y Ramírez, one of New Spain's most respected and prolific scholars, was charged by Viceroy Antonio María de Bucareli with producing a detailed report on cochineal. Alzate's *Memoria sobre la naturaleza, cultivo y beneficio de la grana* (*Treatise on the Nature, Cultivation and the Processing of Cochineal*) is, like the rest of his oeuvre, an enlightened effort to inventory and study the commercial, economic and medical uses of Mexico's natural treasures.[2] Alzate begins his *Memoria* in a critical fashion typical of enlightened Creole discourse in Hispanic America, dismissing the 'absurd and ridiculous things' written by European naturalists who lacked first-hand knowledge of the thing in question. No, the cochineal 'mother' does not wander about the cactus but instead stays attached to one place during its entire adult life. Yes, the species does have male individuals and thus offspring do not spontaneously materialise through putrefaction but are the product of sexual reproduction. Against such nonsense, Alzate presents the results of his own experiments and observations of the insect's morphology and life cycles.

For precise information on the cultivation and harvesting of cochineal, Alzate relied upon his Oaxacan informants. The cultivation of cochineal was a labour-intensive task carried out exclusively by indigenous communities. It depended on detailed knowledge of seasonal cycles of cold and rain, and on regimens of care such as building nests for the insects before releasing them onto the cactus, sheltering them from the cold and protecting them from predators and dirt by brushing them gingerly with squirrel and deer tail hairs. To harvest the insects after they reached maturity, the *indios* scraped them gently off the cacti and then 'suffocated' them, either by drying them in the sun (although this diminished their weight, hence their value) or by placing them in wood-fired saunas or *temazcales* (Figure 4). The final product, cleaned of impurities and chaff, was packed in leather bags and shipped to regional trading centres, then on to the ports of Veracruz and Acapulco, whence the red dye made its way around the Atlantic and Pacific worlds. In the process, adulteration by mixing cochineal with sticks, brazilwood or grains was not uncommon.

For Alzate, the intricate native care required for production of the dye was one of the reasons cochineal could not be transplanted from New Spain to other locales. Thus, Thiéry de Menonville's 'theft' of cacti and insects and his unsuccessful attempt to cultivate cochineal in Saint-Domingue were doomed to fail. 'The French colony', Alzate wrote, 'expected great profit, but their hopes have vanished because the trade in cochineal will continue only as long as it is cultivated by the phlegmatic and astute Indian artisans: it is not a trade that can be plied by other castes of labourers.'

Alexander von Humboldt would repeat these conclusions some years later in his *Essai politique sur le Royaume de la Nouvelle Espagne*, a statistical treatise on New Spain's resources, from its mines and demographics to its agricultural products – including, together with ordinary staples like maize and potatoes,

1 H. Sloane, *Voyage to the Islands Madera, Barbadeos, St Christophers, and Jamaica* (London, 1725), vol. 2, 152–4.
2 J.A. Alzate y Ramírez, *Memoria sobre la naturaleza, cultivo y beneficio de la grana* [1777] (Mexico City: Archivo General de la Nación, 1991).

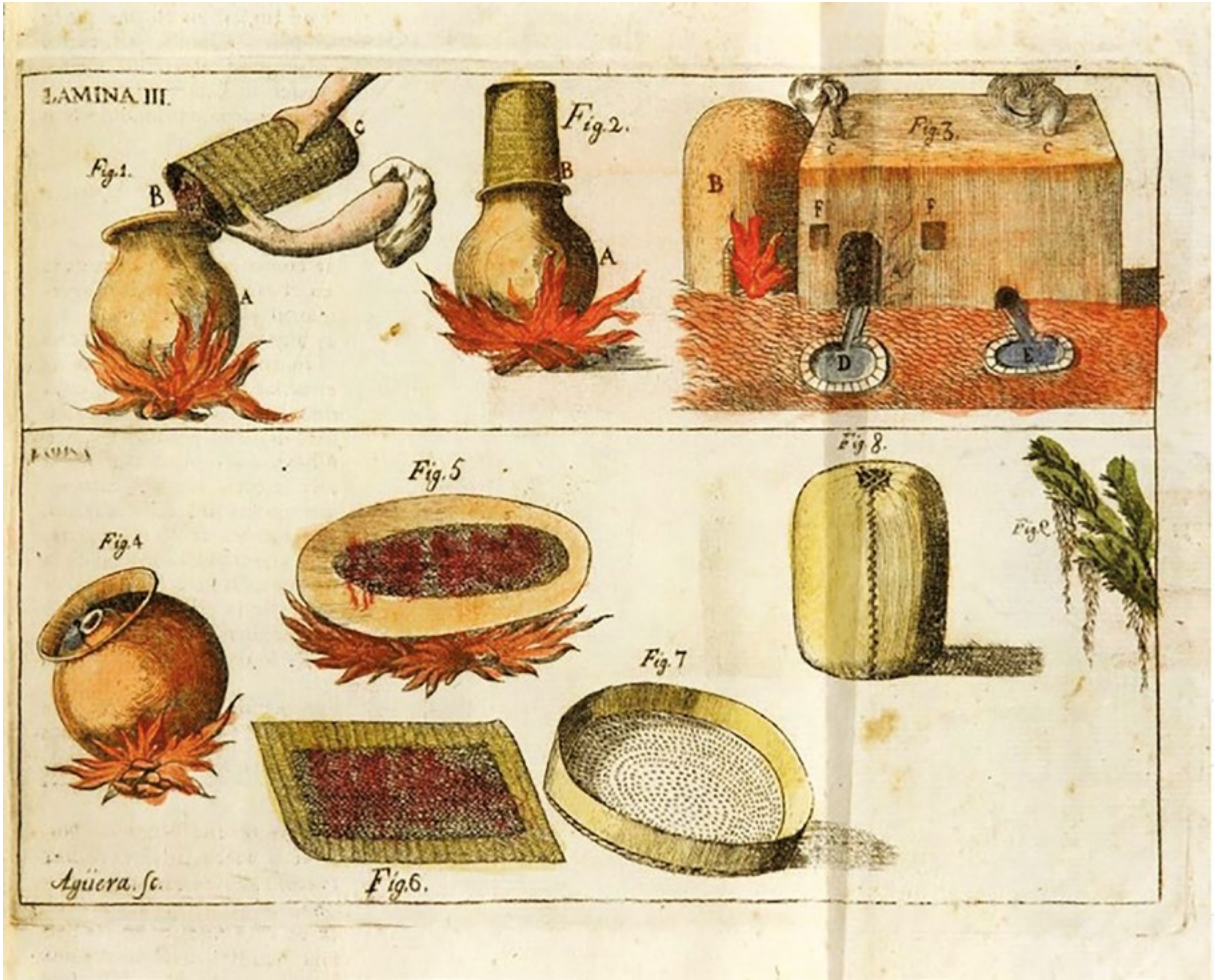

Figure 4. Instruments employed in the preparation of the dye. José Antonio Alzate y Ramírez, 'Memoria sobre la naturaleza, cultivo y beneficio de la grana' [1777], published in the Gazeta de Literatura, *9 August, 1794.*

cochineal and vanilla.[3] The passages devoted to cochineal draw heavily on Alzate's *Memoria*, although Humboldt does not cite the source of his knowledge explicitly. Like Alzate, the Prussian suggests that 'despite the excessive price of cochineal', there are no incentives to cultivate it outside New Spain, 'in countries where one knows how to take advantage of time and work'. For Alzate, on one hand, cochineal thrived locally because Mexico's native artisans had the temperament suited to produce it: artistic agility and the capacity for hard work. Humboldt, on the other hand, thought cochineal implied an amount of toil that was simply not commensurate with the 'universal' capitalist values of labour and hours. It was simply too laborious for those who valued their time.

While agreeing with Alzate that it was impossible to transplant cochineal production to another land, Humboldt represented a very different approach to the natural world and its riches. For Humboldt, nature was available to man in the form of resources, that is, as things that can be counted and standardised, are transferrable from one place to another and

3 A. von Humboldt, *Essai politique sur le Royaume de la Nouvelle Espagne* (Paris, 1811).

are thus available for development and financial speculation. As the Prussian aristocrat mused, 'the smallest corner of the world, if it may come to be the property of European colonists . . . will become witness to the activities that have engaged our species in the last centuries. A colony brings together in a small space all the precious things discovered by man on the surface of the globe.' Cochineal, despite its preciousness, would find no room in such a small place because it did not translate into values like time or money.

Alzate, on the other hand, had very serious misgivings about translation, whether it meant moving between languages or between geographies. He assiduously opposed the first lessons in Linnaean taxonomy, which arrived in New Spain in 1789 along with a botanical garden and a chair of botany. He opposed the Linnaean system on moral and intellectual grounds, in the former case because, as a priest, he believed Linnaean sexual classifications exposed young men to lascivious thoughts, and in the latter, because the new nomenclature erased the original or older names of things. For Alzate those words held knowledge about the origins, meanings and uses of things. Against an abstract, Latinate system of universalisation, Alzate upheld a Neoplatonic vision of natural history as the contingent coming together, in dense and complex ways, of words and things. In our 21st-century world, colour lacks history; we are mostly unaware of where the colours we inhabit come from. Alzate's *Memoria* invites us to rethink perfect red as an assemblage of plants, insects, meteorological conditions, qualities of soil and climates, and temperaments, of places and of people.

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OPOSSUM

José Ramón Marcaida

Of the long list of novel creatures featured in early modern descriptions of the New World, the opossum stands out as particularly wondrous and curious. On the one hand, numerous testimonies point to the opossum's 'composite' or 'chimerical' appearance, conventionally referring to it as 'monstrous'. Thus, Spanish explorer Vicente Yáñez Pinzón (1462–1514), whose account is regarded as one of the earliest, refers to it as a 'Monster, the foremost part resembling a Fox, the hinder a Monkey, the feet were like a Man's, with Ears like an Owl'. On the other hand, and more significantly, many accounts remark on the peculiar presence of a pouch in the opossum's belly, the *marsupium*.

Natural historical interest in such wondrous characteristics, and the fact that the opossum was widely distributed across the American hemisphere, would account for the pervasiveness of this animal in period textual sources. Although these sources often record its local name, e.g. *tlacuatzin/tlaquatzin*, *carigueya*, *micurén*, *churcha* or *(o)possum* – the latter word deriving from the name for the animal in the Powhatan language that was spoken in Virginia – as in the case of other New World creatures like the armadillo or the parrot, the opossum was regularly depicted as a sign for America and was thus featured in a range of visual montages such as Martin Waldseemüller's 1516 *Carta Marina* or Étienne Delaune and Marcus Gheeraerts's *Four Parts of the World* print series (1575 and 1575–1610).

The highly symbolic opossum was the subject of lively debate in the early modern period. An account of the dissection of a female specimen performed by the English physician and fellow of the Royal Society Edward Tyson was published as an entire issue of the *Philosophical Transactions* in 1698.[1] Tyson's study featured more than a dozen sources on the opossum, ranging from naturalist accounts by Gonzalo Fernández de Oviedo (1478–1557) and Georg Marcgraf (1610–44) to reports by John Smith (*c.*1580–1631) and Ralph Hamor (*c.*1589–1626). Of particular interest to the history of the opossum as an object-image of knowledge is the treatise entitled *Historia naturae, maxime peregrinae*, written by the Spanish Jesuit scholar Juan Eusebio Nieremberg (1595–1658).[2] A prolific and widely read author better known for his theological and devotional writings, Nieremberg was the first holder of the chair of natural history at the Reales Estudios (founded in 1629) of the Jesuit Colegio Imperial in Madrid. As reflected in *Historia naturae* and other publications,

[1] E. Tyson, 'Carigueya, seu marsupiale americanum, or, the anatomy of an opossum, dissected at Gresham-College by Edw. Tyson, M.D. fellow of the College of Physicians, and of the Royal Society, and reader of anatomy at the Chyrurgeons-Hall, in London', *Philosophical Transactions of the Royal Society*, 20, no. 239, (1698): 105–64.

[2] J.E. Nieremberg, *Historia naturae, maxime peregrinae* (Antwerp: Plantin-Moretus Press, 1635).

his natural historical and natural philosophical interests were varied, ranging from the investigation of monsters and other natural wonders to enquiries into occult philosophy and magic. In a chapter devoted to 'animals with pouches', Nieremberg proceeds to present and contrast a number of written descriptions of the opossum, which he calls by its Nahuatl name *tlaquatzin/tlacuatzin*, starting with the corpus of materials compiled by the 16th-century Spanish physician Francisco Hernández (1514–87) during his seven-year-long, state-sponsored expedition to New Spain (1570–77). Nieremberg had at his disposal the expedition texts and illustrations – kept, at the time, at the library of El Escorial – as well as other Hernández materials preserved at the library of his own Colegio Imperial. Nieremberg's discussion of the opossum makes ample use of Hernández's writings, which include allusions to the wondrous artifice of its pouch and a reference to its striking congenital ability to 'play dead' in front of its captors. Nieremberg also transcribes Hernández's significant account of the local medicinal use of the opossum. A drachma of the tlacuatzin's powdered tail, mixed with water and drank on its own at various intervals, would cleanse the urinary tract, stimulate the production of urine and milk, increase the libido, heal fractures and colic, speed up delivery and cause the period to start. Additionally, when applied on the body, the powdered tail could help the extraction of thorns and would soften the belly. Nieremberg adds a brief extract from the work of the Spanish chronicler Antonio de Herrera (1549–1626): the opossum's tail is a good remedy to treat fever and to help pregnant women go into labour.

Nieremberg's chapter also features extracts from authors such as Peter Martyr d'Anghiera (1457–1526), Girolamo Cardano (1501–76) and Hans Staden (*c.*1525–79), whose accounts tend to privilege the pouch as the opossum's most striking feature. Regarding the medicinal use of the animal's tail, this information had been known to Europeans for quite some time, not least through various 16th-century written accounts, including Bernardino de Sahagún's *General History of the Things of New Spain* and the *Codex de la Cruz-Badiano*, as well as two of the first printed treatises to feature Hernández's texts: Juan de Barrios's *Verdadera medicina, cirugía y astrología*, published in Mexico City in 1607, and Francisco Ximénez's *Quatro libros de la naturaleza y virtudes de las plantas y animales que estan recevidos en el uso de la medicina en la Nueva España*, also published in Mexico City, in 1615.[3] These accounts remark upon the purgative power of the opossum's tail and praise its effects when administered to pregnant women during difficult deliveries.

Nieremberg's chapter features a new illustration of the opossum (Figure 1). Taking up most of the folio-sized page, it is one of the most arresting images in the whole treatise, which features 70 woodcut illustrations. It represents a female tlacuatzin and her offspring, which appear to be emerging from her pouch. The woodcut nicely depicts such features as the opossum's small head, pointed snout and vivid eyes, as well as its long and curly fur and its hairless and snakelike tail. The illustration is especially effective in capturing the overall appearance of the opossum, in a way that makes it stand out from earlier depictions of this animal. Evidence that the image was appreciated by period readers can be found in Tyson's account of his dissection of the animal, where in the context of a review of previously published illustrations of the opossum he writes that the one featured in Nieremberg's treatise 'seems to be taken from the Life' and, although 'not in all Particulars exact', 'is much to be preferred before the others'. This image of the opossum bears the initials of Christoffel Jegher (1596–1652), an important 17th-century Flemish wood engraver who worked for the Plantin-Moretus Press in Antwerp in the 1620s and 1630s. Jegher is best known for the series of woodcuts that he produced in collaboration with Peter Paul Rubens, regarded as landmarks in the use of this technique during the 17th century. Nieremberg's opossum served as a model for later representations of the animal, such as the illustration featured in Jan

[3] B. de Sahagún's *Historia general de las cosas de Nueva España* (16th century, manuscript), Biblioteca Medicea Laurenziana, Florence; Martín de la Cruz and Juan Badiano, *Libellus de Medicinalibus Indorum Herbis or Codex de la Cruz-Badiano* (Tlatelolco, Mexico, 1552), Biblioteca Nacional de Antropología e Historia, Mexico City; J. de Barrios, *Verdadera medicina, cirugía y astrología* (Mexico City: Fernando Balli, 1607); F. Ximénez, *Quatro libros de la naturaleza y virtudes de las plantas y animales que estan recevidos en el uso de la medicina en la Nueva España* (Mexico City: Widow of Diego López Dávalos, 1615).

Figure 1. Opossum *(tlaquatzin) in J.E. Nieremberg,* Historia naturae, maxime peregrinae *(Antwerp: Plantin-Moretus Press, 1635).*

Jonston's *Historiae naturalis de quadrupedibus libri* and Jan van Kessel the Elder's *Four Parts of the World* (1660, Prado Museum).[4]

Numerous references to Nieremberg's work in period accounts show the extent to which his texts and images circulated and were appropriated for a variety of purposes. Long regarded as a mere compiler of other authors' writings, Nieremberg has recently won praise for his cunning amalgamation of descriptions, testimonies and ideas. *Historia naturae* in particular appears to have been extensively consulted by early moderns in relation to the natural and medical knowledge extracted from the Hernández expedition materials and other sources. The case of the opossum illustrates the important textual and visual dimensions that, in turn, guaranteed the global impact of such New World knowledge.

[4] J. Jonston, *Historiae naturalis de quadrupedibus libri* (Amsterdam: Johann Jacob Schipper, 1657).

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GUINEA PIG

Helen Cowie

In the heart of Cusco Cathedral hangs an iconic oil painting by Marcos Zapata (also known as Marcos Sapaca Inca) depicting the Last Supper (Figure 1). On the table in front of them is laid out a sumptuous banquet, consisting of corn or *chicha* beer, potatoes, peppers and a freshly roasted guinea pig. Zapata's Andean Last Supper registers the exchange of cultures, foods and animals in the New World and highlights one of its most ubiquitous components: the humble guinea pig, or *cuy*. A common dish in the Andes, as well as a frequent sacrificial animal, the guinea pig was one of just three domesticated mammals in pre-Colombian South America (along with the llama and the alpaca). In the world beyond the Andes, the guinea pig emerged as a global animal, gracing houses (though not usually tables) across early modern Europe and becoming, in time, a popular pet and laboratory subject. Today it is widely consumed in Africa and Asia as well.

Domesticated around 5000 BC, the cuy (*Cavia porcellus*) was often kept in homes or in nearby pens or pits and consumed on a regular basis. Twenty-three well-preserved individuals have been excavated at Cahuachi, a major ceremonial centre for the Nazca culture, while guinea pig pens have been identified at Chan Cauchi, the capital of the Chimú empire. The Quechua name *quwi* or *cuy* is an onomatopoeia that registers the high-pitched squeaks and skittish nature of the animal. According to the erudite Jesuit missionary Bernabé Cobo (1582–1657), who lived for more than 50 years in Peru and Mexico in the early 17th century, 'The Indians eat this animal with the skin on, only peeling it off as if it were a piglet, and it is for them very tasty food . . . [T]hey usually make it into a stew, having removed the belly, with a lot of pepper and smooth pebbles from the river, which they call *calapurca*, which means in the Aymara language "belly stones", because in this stew they put the said pebbles in the belly of the cuy'.[1] Such culinary preparation of the cuy continues today throughout the Andean region and beyond.

In addition to eating the cuy, Andean peoples have long sacrificed them in propitiation rites, often extracting their entrails to divine the future. The Jesuit natural historian José de Acosta, writing of the Incas, recounted that 'in their sacrifices they used to offer these *cuyes* very frequently'.[2] The Jesuit-trained Andean chronicler Felipe Guaman Poma de Ayala wrote that in the month of Chacra Yapuy Quilla (August), the Incas sacrificed '*cuuies* [guinea pigs] and *uacas* [*Spondylus* shells] . . . and *chichi* [maize beer] and *carneros* [llamas]'.[3] Cobo reported that

[1] B. Cobo, *Historia del Nuevo Mundo* (Seville: Imprenta de E. Rasco, 1890), vol. 2, 307.
[2] J. de Acosta, *Natural and Moral History of the Indies*, J. Mangan, ed., F. López-Morillas, trans. (Durham, NC: 2002), 240.
[3] F. Guaman Poma, 'August: month of the turning of the soil', *El Nuevo Corónica y Buen Gobierno* (1615), Royal Library of Copenhagen, shelfmark GKS 2252 4, 253.

Figure 1. Marcos Zapata, The Last Supper, c.*1753 (courtesy of Y. Levy/Alamy Stock Images).*

'they [the Indians] frequently take advantage of these little animals to determine the success of things in the future, opening them up and looking inside them for certain signs'.[4] Ethnographic studies describe a still-common method for diagnosing maladies that entails rubbing a live cuy over the body of the patient then slitting it open to see which of its organs exhibits signs of discolouration.

The Old World first encountered the Peruvian cuy in the 16th century. A curious gift of the Columbian exchange of peoples, cultures, plants, animals and microbes that marked the first age of globalisation,

[4] Cobo, *Historia del Nuevo Mundo*, 307.

the Spanish called the animals *conejo de Indias* ('rabbit of the Indies'), the French *cochons d'Inde* (pigs of the Indies) and the Portuguese *porquinho-da-índia* (piggies of the Indies); in Mandarin Chinese the cuy was called *tún shǔ*. The infamous English term, 'guinea pig', is of uncertain origin. One theory holds that 'guinea' referred to the original price, while another suggests that it registers the history of the slave trade that brought the furry creatures to British shores – hence the mistaken belief that they originated in West Africa. A third theory asserts that 'guinea' is a corruption of Guyana in northern South America, in the 16th century spelled 'Guiana', whence the animals may have been shipped across the Atlantic.

We may trace the guinea pig's global career via representations of the animal in art. Jan Brueghel's *The Feast of Bacchus* (*c.*1640) represents two multicoloured guinea pigs nibbling on a pea pod (Figure 2). Teodor Lubieniecki's *Still Life with Guinea Pigs* (late 17th century) depicts two of the animals peering at a basket of fruit, while Albert Eckhout's portrait of a Brazilian *mameluca* (1641) has a pair of guinea pigs emerging from the undergrowth, possibly as a sign of fertility. Other notable guinea pig artworks include a miniature by Flemish artist David de Coninck, which features two plump cuyes sniffing a bunch of grapes; Felice Boselli's *Still Life with a Pigeon and Guinea Pig* (*c.*1690), which shows a guinea pig examining a piece of fruit; and Jakab Bogdány's *Capuchin Squirrel Monkey, Two Guinea Pigs, a Blue Tit and an Amazon St Vincent Parrot with Peaches, Figs and Pears in a Landscape* (1710–20), in which two inquisitive guinea pigs inspect a pear.

Figure 2. Detail from *Jan Brueghel,* The Feast of Bacchus, c.*1640 (Gemäldegalerie, Berlin; photo by H. Cowie).*

One portrait of three children by an unknown artist depicts a seven-year-old girl cradling a podgy cuy in her arms, while a boy next to her clutches a bird. Dated around 1580, this is believed to be the oldest English representation of a guinea pig and suggests the early adoption of the animal among elites as a pet. It is notable that in many of these paintings, guinea pigs are portrayed in the act of eating.

In the Viceroyalty of Peru, the cuy retained its ritual or sacrificial uses and continued to feature in religious ceremonies, despite efforts on the part of some church officials to suppress such practices. Writing in the late 16th century, Mercedarian friar Martín de Murúa complained that cuyes were still used clandestinely in divination and remained a commonplace source of food in Andean dwellings.[5] Several decades later, in 1621, Padre Pablo José de Arriaga condemned the surreptitious use of the animals 'not only in sacrifices, but for divination and medicine', describing how the Indians 'sometimes open [the animals up] with a thumbnail' and sometimes 'drown them in a bowl of water, holding the head under until they die' and opening them 'from top to bottom'. Arriaga remarked that 'if it were possible to exterminate them, it would be a good thing, but everyone keeps them in their houses, and they multiply so quickly that they can even be found in Rome, where I was very surprised to see them being sold publicly'.[6] It is the centrality of the cuy to the Andean diet and religious belief that explains its appearance in Marcos Zapata's mid 18th-century painting of the Last Supper in Cusco Cathedral.

By the 18th century, the cuy or *conejo de indias* was the object of growing interest among Hispanic natural historians. Spanish botanist Hipólito Ruiz, who lived in Peru between 1777 and 1788, remarked on the widespread presence of 'coyes or cuyes' in Huánuco and other Peruvian cities, noting that 'wherever guinea pigs are bred, there is always a tremendous plague of minute fleas, unbearable because of their bites'.[7] The vogue for collecting things monstrous was reflected in the observations of the Jesuit naturalist Juan de Velasco, who commented on the malformed cuy specimens that he observed in his native Quito. One animal had 'two heads joined by a single neck', another 'one head and neck and all the rest duplicated', a third 'two bodies up to the waist, from there only one' and a fourth 'two complete bodies, linked only by the back'.[8]

Following the establishment of the Real Gabinete de Historia Natural in Madrid in 1772, colonial bureaucrats also started to ship man-made *(artificialia)* and natural *(naturalia)* specimens to Madrid for analysis and exhibition, adding to a growing royal collection founded and directed by the Guayaquil-born Peruvian Creole Pedro Franco Dávila (see 'Creole Cabinet' in this volume). The viceroy of New Granada, Manuel Antonio Flórez, dispatched three large boxes containing '86 species of plants, well dried and preserved between pieces of paper . . . two well-preserved monkeys' and 'part of a feather from the wing of a condor'.[9] The governor of Santa Marta sent 'a bat caught in his own house and two sea horses', while the governor of Guayaquil donated 'a live caiman in a box', 'a tiger [jaguar] cub' and 'a little monkey the colour of cinnamon'.[10] Guinea pigs were among the many natural history specimens that made their way into the Real Gabinete of Franco Dávila, taking their place alongside the West Indian anteater and the East Indian elephant. In 1789 the bishop of Trujillo, Baltasar Jaime Martínez Compañón, sent 24 boxes of stuffed animals, plants and artefacts to the Real Gabinete, including three ceramic Chimú stirrup jars (Figure 3), a stuffed 'ginger guinea pig, male' and an illustration noting key anatomical features.[11] Painted by one of Martínez Compañón's unidentified Peruvian artists, the latter features a view of the rodent's mouth, revealing its large incisors, and a close-up of the ear bones, considered to bring good luck if ingested (Figure 4). The fact that Martínez

5 M. de Murúa, *Historia general del Perú* (Madrid: Dastin, 2001), 408–9.

6 Pablo José de Arriaga, *Extirpación de la idolatria del Perú* (Lima, 1621), 25.

7 Hipólito Ruíz, *The Journals of Hipólito Ruíz, Spanish Botanist Peru and Chile 1777–1788,* R.E. Schultes and M.J. Nemry von Thenen de Jaramillo-Arango, trans. (Portland, 1998), 143.

8 Juan de Velasco, *Historia del reino de Quito en la América Meridional*, (Quito, 1841), vol. 1, pt 1, 133.

9 AGI Indiferente 1549.

10 Museo Nacional de Ciencias Naturales, Fondo Museo, Sección A – Real Gabinete, legajo 171; AGI Indiferente 1549.

11 Museo Nacional de Ciencias Naturales, Fondo Museo, Sección A – Real Gabinete, legajo 73. For a detailed appraisal of the Bishop's work, see E.B. Soule, *The Bishop's Utopia* (Philadelphia: Penn State University Press, 2014).

Figure 3. Vessels representing a cuy or rabbit of the Indies, one of the few domesticated animals in pre-Columbian America. Chimú culture, AD *1000–1470, ceramic, Peru (photo by H. Cowie).*

Compañón's Peruvian collection included both live guinea pigs and human representations of the animals responded to specific royal instructions for collecting and reflected the naturalia/artificialia division then prevalent in natural history cabinets.

Guinea pigs have gained a truly global foothold in the modern world, although in a variety of different ways. In Europe, the animals increasingly assumed

Figure 4. 'Cui casero', from Trujillo del Perú, *vol. 6, plate 1 (courtesy of Patrimonio Nacional).*

a role, first as an elite mascot and then a popular pet, with growing numbers of the species inhabiting European homes from the mid 19th century onward. One writer in the RSPCA's monthly magazine, *The Animal World*, recommended the guinea pig as an ideal pet for children, since 'its appetite is unbounded and no matter how much it may eat it never appears to be at all unwell in consequence'.[12] Another, the Reverend C.G. Blaydes, rhapsodised over the intelligence of his parishioner's guinea pig, which 'will sit up for things, particularly orange-peel, of which it is very fond when dried'; a third bought a 'guinea pig companion' for his pet marmoset (another itinerant American animal).[13] An 1886 manual entitled *The Guinea Pig, or Domestic Cavy, for Food, Fur and Fancy* advocated breeding guinea pigs for show and even eating them in cavy ragouts, cavy curries and cavy

12 *The Animal World*, 'Guinea pigs', July 1888, 110; *The Bazaar*, 21 October 1905, 1, 639.
13 *The Animal World*, 'An interesting pet', June 1883, 86.

Figure 5. Cuyes, Pisac Market, 2015 (photo by H. Cowie).

pies. Consuming guinea pigs as meat never really caught on in Britain, but the animals have become common in laboratories – hence the colloquial use of the term 'guinea pig' to mean test subject.

Beyond Europe, guinea pigs have made their mark in Asia and Africa, where they have been adopted as both pet and food source. In Japan, where guinea pigs were likely introduced by the Dutch East India Company, they are called *morumotto* (Dutch for 'marmot') and have become popular pets and even fashion icons. Maki Yamada's Guinea Pig Fashion store in Tokyo sells tank tops, tuxedos, wigs, hats and kimonos for guinea pigs and ships its products around the world.

In Africa, guinea pigs are more commonly reared for food, and their farming has been promoted by conservationists as a sustainable alternative to bushmeat. A national livestock census revealed that there were an estimated 600,000 guinea pigs in Tanzania in 2008, while there are thought to be around two million in the Democratic Republic of the Congo. African farmers also value guinea pigs for their manure, which is higher in nitrogen than manure from other livestock.

In contemporary South America cuyes continue to be bred for food, with an estimated 65,000 guinea pigs eaten annually in Peru alone. The cuy is also consumed very widely in Ecuador and Bolivia, as well as southern Colombia and northern Argentina and Chile. Many of these animals are reared in individual households, like these cuyes photographed at the Pisac Market near Cusco (Figure 5). Many, however, are farmed in large breeding facilities. Since 2013, Peru has observed National Cuy Day (the second Friday in October) to promote the breeding and consumption of this native animal, and the town of Huacho, north of Lima, hosts a cuy festival every July, which includes cuy fashion competitions and cuy races (the contestants are eaten afterwards). Chinese immigrants to Peru have also given a new twist to traditional cuy dishes, with restaurants in Lima's Chinatown serving sweet-and-sour guinea pig fried in oyster sauce.

Eaten, sacrificed, fashioned from clay, represented in art and adopted as a pet, the tiny cuy or guinea pig has developed an impressive global career.

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BEZOAR

José Pardo-Tomás

Figure 1. Panel of the Salvador cabinet designed by Josep Salvador i Riera (1690–1761) and containing the bezoars (courtesy of the Institut Botànic, Barcelona (IBB); photo by N. Hervás).

The strange object labelled *Lapis Bezoar ex Iguana* rests today in the reassembled cabinet of medicinal curiosities that was kept for centuries in the back room (*rebotica*) of the Salvador family apothecary in Barcelona, Spain (Figure 1). What is this strange object doing here? And what can it tell us about the place of New World objects in the global history of collecting and medicine?

This particular object, and indeed all those called bezoars, was believed to possess medicinal powers (Figure 2). But by what criteria was this bezoar stone placed in the reserved cabinet or rebotica collection rather than on the open, commercial shelves of the apothecary? Where was the line drawn between the marvellous or curious object and the commercial commodity that could be readily sold as medicine in the dispensary? This line reflects both the presentation and disenchantment of nature that followed from the first globalisation, while the ex-iguana bezoar stone registers the ambiguities of authenticity in the Indies. In truth, there was no fixed line between the

Figure 2. Jar containing Lapis Bezoar ex Iguana *(courtesy of the Institut Botànic, Barcelona (IBB); photo by N. Hervás).*

marvellous and the mundane, or indeed between the authentic and the fake; instead, there was a continuous movement, reflecting the changing state of knowledge, geopolitical realities and the private interests of those who curated the collection and ran the apothecary.

Bezoar stones are concretions with a hard nucleus found in the stomachs of certain animals. They were among the most sought-after objects susceptible to two-way transit between pharmacies and *Wunderkammern* or curiosity cabinets, in part because they linked two exotic points of origin 'in the Indies' that were united under Iberian empire and trade. Indeed, the connection between the two Indies in the European market in *materia medica* reveals key elements of the process of the first globalisation of knowledge about the natural world. In that global field, America or the 'Occidental Indies' became a realm of substitutes that could compete with drugs, spices and medicines from the 'Oriental Indies' or Asia. Initially, Spain's main rivals in the global *materia medica* trade were the Portuguese and the Venetians, but these were soon joined by British, Flemish, French and Dutch interests. 'Oriental' bezoars had circulated around the Mediterranean world since the Middle Ages, and indeed between the Middle East and continental Europe. These had begun to arrive in greater numbers from the last decades of the 15th century, when the Portuguese opened up the sea route to India and the oriental Indies. 'Occidental' bezoars, which were 'invented' in the New World or occidental Indies by Iberians who drew upon local knowledge, began to arrive on the European market of exotic medicinal products in the 1560s, where they competed with the oriental bezoars already there.

By the 17th and 18th centuries, the unreliability of information concerning the origin and properties of bezoars from Iberia's oriental and occidental Indies, combined with the need to obtain proof of authenticity in an expanding trade rife with falsifications, provoked scientific controversies. These in turn encouraged the gathering of additional information and the development of new experimental practices. A bezoar extracted from a reptile and not a ruminant, coming from Yucatán and not from the mountains of Persia, was potentially a polemical object riddled with ambiguities. These very same ambiguities could make it valuable as a collector's item. The ambiguity of an iguana bezoar in a cabinet like that of the Salvador family is reflected in questions concerning its epistemological or even ontological status. Was it genuine or false, an original or an imitation, natural or artificial, real or imaginary? And what were the consequences of opting for one side of the dichotomy or the other?

The question of economic interest, the criteria of verisimilitude that operated in the linking of new medicines with new maladies and the success obtained by various American substitutes for oriental or Asian medicinal products were three factors that influenced the conferral of authenticity, originality and naturality on the American bezoars, including those derived from reptiles like the iguana. On the other hand, behind the presence of this object in the Salvador collection is the complex and tricky question of the appropriation and disenchantment of the natural world. It is this question that makes the cabinet of natural curiosities a paradoxical place. Indeed, the Iberian invention of the substitute American bezoars invites us to consider the expropriation of nature and native knowledge about nature.

The *americana* collection in the cabinet of the Salvador family reflects the history of scientific controversies and medicinal uses that surrounded the commercial circulation of *artificialia* and *naturalia* from the Indies. Most of its contents have survived, including thousands of items of naturalia, almost five thousand leaves of the herbarium and more than fourteen hundred books, as well as the furniture, drawers and shelves of the cabinet, all made in the middle decades of the 18th century. Also surviving is a rich collection of documents consisting of various manuscripts, notarial files and hundreds of letters from correspondents in France, Italy, Holland, England, Portugal and Spain. In addition, there are numerous testimonies left by visitors to the cabinet. This material makes it possible to arrive at a fairly clear picture of the circulation and handling of American curiosities in Barcelona over the course of the almost two centuries of the cabinet's existence.

In theory, one would expect that, as a city of the Spanish crown, the main route of the exotic *materia* from the Indies would have been via the Atlantic ports of Cadiz and Seville, but this was not the case. Although some items certainly reached Barcelona via Andalusia, the evidence of the letters, labels and leaves of the herbarium demonstrates that most of the *americana* in the Salvador collection arrived via the global ports of London, Leiden, Amsterdam and particularly Lisbon. Many of the items came from Jamaica, Suriname and Brazil rather than from Mexico, Peru or Cuba. Our Barcelona apothecary and cabinet, it turns out, was connected to a global web of Indies trade that extended beyond the Hispanic realm.

The London connection began in 1706 when the oldest member of the third generation of the family, Joan Salvador i Riera (1683–1726), was obliged to interrupt his grand tour – which had taken him to Montpellier, Paris, Rome, Naples, Palermo and elsewhere – and return to Barcelona. The turbulent situation in Europe that followed the War of Spanish Succession (1701–14) had complicated trade. In the Iberian Peninsula, the lands of the crown of Aragon (Valencia, Aragon and Catalonia) sided with the Austrian Habsburg candidate, who was eventually established in Barcelona. The city became a seat of the court and was frequented by the fleets of Habsburg allies, namely the Dutch and English crowns. Given a situation that favoured communication with Holland and England rather than France, Joan Salvador decided to send a letter to London on Christmas Eve 1706. Addressed to James Petiver (1665–1718), an apothecary established in London since 1685, fellow of the Royal Society and possessor of an enormous natural history collection, Salvador wrote: 'I ask you, Sir, to be so kind as to send me a share of the plants and other curiosities that you receive from the Indies, such as shells, butterflies and others, the knowledge of which I am extremely enthusiastic about.' In return, Salvador offered fossils, samples of salt from the Cardona mines, shells, marine plants and whatever local natural product might interest the London collector. The intense correspondence continued for 12 years until Petiver's death in 1718. The letters exchanged between James Petiver and Joan Salvador reveal how some of the American flora, fauna and minerals were already 'packaged' before they circulated among several European collectors. They were offered in lots, identified and included in a series that might therefore recur in an identical form in different cabinets. Afterwards, the Salvador family continued to maintain contact with England via Hans Sloane, owner of a vast collection and founder of the British Museum, who acquired the Petiver collection and no doubt his contacts as well. Petiver had managed to establish a global network of agents, intermediaries and correspondents as diverse as Jesuits and pirates, naval officers and filibusters.

The Dutch connection of the family in Barcelona went back further still but was also strengthened by the War of Spanish Succession. The two main correspondents and suppliers were Hermann Boerhaave in Leiden and George Clifford III in Amsterdam. The correspondence reveals the arrival in the Barcelona cabinet of armadillos, iguanas, serpents, bezoars and an infinity of americana, as well as books published by Boerhaave and dedicated to the Salvador family. In the Dutch case, evidence suggests that americana also travelled in the opposite direction, from Barcelona to Amsterdam. These americana included plants, fruits and seeds that did not come directly from the New World but had been cultivated for many years in Spain; sweet potatoes and potatoes, tomatoes and peppers, agaves and *Opuntia* cacti were abundant crops in Valencia, Murcia and Andalusia.

Finally, the Lisbon connection was a pipeline of americana for the Salvador collection and pharmacy, indispensable for fauna, flora and minerals from the New World. In the last decades of the 17th century and the first half of the 18th, Lisbon was a cosmopolitan city with a key position in global commercial traffic and information about extra-European or Indies natural products. The network set up in Lisbon by the Salvador family included a group of merchants, some of whom were relatives and others would-be relatives. They were all Catalonian in origin, if not from the Maresme itself, the coast just north of Barcelona where the Salvador family originated. The dozens of surviving letters from that correspondence are written in Catalan and are full of family or local news that go beyond a strictly commercial relation. There are continuous references to the arrival of Portuguese vessels from Brazil (Rio, Pernambuco and Bahia), Guinea and India. Such references punctuate the letters that Martí, Sala and other correspondents sent to the Salvador family. These letters accompanied products destined for both the dispensary and the cabinet, including our *Lapis Bezoar ex Iguana* (Figure 2). The small glass jar containing our specimen was kept in a splendid cupboard containing some five hundred similar jars (Figure 3). It took its place beside objects with labels such as *Pedra Bezoardica, Lapides Bezoar Porci, Lapis Bezoar Orientalis, Lapides Isti Reperti in Pene Suis, Lapis Bezoar ex Equus Marinus, Bezoar de Serpiente, Lapis Bezoar ex Capra*, and so on.

The cupboard of the cabinet in question was made by Josep Salvador i Riera (1690–1761), only a few years after Hans Sloane's notable discussion of bezoars appeared in the *Philosophical Transactions* of 1749. Sloane had described the 'Rhinoceros bezoar' from Mombasa and another stone found 'in the Head of the most venomous Snake of the East Indies called *Cobra de Cabelo*'. In a letter to the Royal Society, Sloane relied upon the authority of the *Esperienze intorno a diverse cose naturali* of Francesco Redi (1686), in which the Tuscan physician expounded his experiments with bezoars of various kinds, including that of the American iguana, as well as other remarkable products of both Indies. Both these works were held in the Salvador library.

In short, that some bezoars found themselves adjacent to others on a reserved shelf in a Barcelona apothecary reflected both the scientific controversies regarding New World nature and the position of its products in an increasingly globalised world shaped by the inseparable duo of the two Indies, first united by Iberian trade and collecting networks.

Figure 3. Section of the cupboard shelves (courtesy of the Institut Botànic, Barcelona (IBB); photo by N. Hervás).

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CACAO

Peter Mason

Among the rich holdings of the Biblioteca Marciana on the Piazza di San Marco in Venice are five volumes of sheets containing a total of 1,028 drawings of plants by various hands, including more than 40 plants from the Americas. This is already enough to make them interesting to Latin Americanist scholars, but the big surprise comes when you open the so-called *Blue Book* (*Libro azzurro*). On the very first folio you see a tree bearing red fruit directly from its branches, with four oversized butterflies poised in the air or perched on a branch in a very non-naturalistic way.

If you continue to leaf through the 161 pages of the *Blue Book*, no fewer than 11 tree images share these same peculiar stylistic characteristics. Besides grasshoppers, butterflies and other insects, they feature various exotic birds, a lizard and an animal similar to an opossum. Their primary activity is eating: in one of the images a bird of prey is eating an insect, while a lizard hungrily eyes an epiphyte orchid or, more probably, something edible inside it. The trees themselves are all fruit-bearing, and grasshoppers formed an important part of the Mesoamerican diet.

To anyone familiar with the work of indigenous painters in Central America, these 11 images have a decidedly American look about them. But what are they doing in this collection of botanical drawings in Venice?

The compiler of the volumes is known to us. Pier'Antonio Michiel was born to an aristocratic family in Venice in 1510. He kept a garden next to his home in which he acclimatised, cultivated and reproduced many of the plants described in the five volumes, and he became so knowledgeable in botany that in 1551 he was made superintendent of the botanical garden founded six years earlier in the University of Padua, a position that ensured frequent contact with the leading authorities on plants of his day. He died during the plague epidemic of 1576.

This brief biographical outline gives us a date for the formation of the collection somewhere in the third quarter of the 16th century, with a cut-off around 1570, when he had decided to have the work printed (although it never was). Further information is available from the comments that Michiel wrote on the verso of each sheet. Those from the first sheet of the volume state:

> This painting was brought from India together with ten other trees, as you will see here, to his imperial majesty, where the spokesman for his majesty at the time, Marc'Antonio da Mula, who is now a cardinal, had copies made from those of his majesty, and I took the present paintings from these.[1]

[1] P.'A. Michiel, *I cinque libri delle piante. Libro Azzurro*, fol. 1v.

From these words we can deduce that the 11 images in question are the result of two successive copying operations. Original paintings done in 'India', i.e. the Americas, were taken to the court of the Holy Roman emperor Charles V (Charles I of Spain). Copies of these were made for Marcantonio da Mula, and a second series of copies were made from these in turn for Pier'Antonio Michiel, which are the ones he included in his *Blue Book*.

Marcantonio da Mula, who was born in Venice in 1506, belonged to the erudite humanistic circles of the time and was the ambassador of the Venetian Republic at the court of Charles V, later rising to hold important positions in papal Rome, where he was in charge of the Vatican Library until his death in 1572. He is particularly interesting in the present context for his connection with indigenous American painting: in the case of copies of images from the codex variously known as *Codex Vaticanus 3738*, *Codex Vaticanus A* and *Codex Ríos*, it was da Mula who functioned as the intermediary between the arrival in Europe of these images of American origin and copies taken from them for a work by the humanist scholar Lorenzo Pignoria published in Padua in 1615.

So far, we have a route for the transmission of American images from the Americas via Spain to Venice and Padua. Matters, however, are not that simple. Another Italian collector and expert on the natural world, Ulisse Aldrovandi, outstripped Michiel by far with the almost three thousand watercolours now contained in 18 volumes in the Bologna University Library. Four of these images correspond to four of the 11 American images in Michiel's *Blue Book*. However, they are not a perfect match; sometimes one of Aldrovandi's paintings is more detailed, sometimes it is one of Michiel's that yields fuller information. This would seem to rule out the possibility that one set was copied from the other.

Light is thrown on the question by a letter that Aldrovandi wrote to the grand duke of Tuscany in September 1577. On one of these paintings of a tree (the *Persea*), he comments, 'I received the painting from Portugal and some Spaniards call it *Quoyaud colorado*', and on two others (*Berberis America* and *Acacia Americana*) he states that he received them 'from Lisbon many years ago'.[2]

So, at the risk of confusing the reader even more, we have to introduce a further series of copies. Aside from the American originals and the copies of them made in Spain for da Mula and Michiel, we now have to add the copies made for Aldrovandi that, he claimed, had come via Portugal, as well as at least one reproduction that Aldrovandi had made from one of his own copies for the grand duke of Tuscany in Florence.

Much has been written on the expedition of Francisco Hernández to collect information about the natural world of New Spain (present-day Mexico) for the Spanish monarch Philip II between 1570 and 1577, as well as on the subsequent fate of the Hernández material after it reached Europe. However, the images in the collections of Pier'Antonio Michiel in Venice and Ulisse Aldrovandi in Bologna show that there was a lively interest in American *naturalia* and an extensive circulation of images of them between the Iberian and Italian peninsulas before Hernández had even set foot in Mexico. Indeed, Aldrovandi was already agitating for an expedition to the Americas in the 1560s.

On the basis of stylistic considerations and of the words of Pier'Antonio Michiel himself, it may be assumed that the 11 trees represented in Michiel's *Blue Book* are American. Although the names that Michiel provides, such as *Quayautl colorado* and *Quahuxilots*, seem to be derived from Nahuatl, one of the indigenous languages of Mexico, it is obvious that whoever transcribed them on the pages in the *Blue Book* was ignorant of Nahuatl, and it would be hazardous to attempt to identify the species with any degree of certainty. One tree image in particular, however, does offer a further clue. The tree on folio 67 is named '*Cacao blanco da Indiani overo Spagnioli*' ('white cacao by the Indians or Spaniards'), written in a curious code Michiel used that reversed the direction of each letter. We see a tree (like the others, depicted without roots) with a profusion of green

[2] A. Tosi (ed.), *Ulisse Aldrovandi e la Toscana: Carteggio e testimonianze documentarie* (Florence: Leo S. Olschki, 1989), 224–31.

Figure 1. Cacao blanco da Indiani overo Spagnioli. Pier'Antonio Michiel, I cinque libri delle piante, Libro azzurro It. II, 30 (=4864), f. 67r (su concessione del Ministero dei Beni e delle Attività Culturali e del Turismo – Biblioteca Nazionale Marciana. Divieto di riproduzione).

or greenish-blue leaves (the indigenous languages of Mesoamerica do not distinguish between these two colours) and red-brownish fruits, around which are flitting four butterflies and several other insects. As the name indicates, in this case it is not difficult to recognise a (schematic) image of a cacao tree.

Michiel's commentary states that 'it was transported from India by painting to Spain' and that 'its fruits are like figs'. Because it is a New World species unknown to the Old World before the European discovery of America, Michiel falls back on a comparison between the unfamiliar (cacao) and the familiar (figs). Yet he has to add the rider: 'but upside down with pointed tips of a yellow colour with purple that kindles your appetite when you look at them'. So they resemble figs, but there are differences. Faced with the limitations of verbal descriptions when it came to explaining the novelties of tropical flora to a European audience, the first author to write a natural history of the New World, Gonzalo Fernández de Oviedo (1478–1557), had recommended visual representation: 'It should rather be painted by the hand of Berruguete or another excellent painter like him, or by that of Leonardo da Vinci or Andrea Mantegna, famous painters whom I knew in Italy.'[3] For the same reason, Aldrovandi's planned expeditionary force to the New World would have included painters as well as writers. Even if the taste and smell of cacao fruits could not be conveyed in words, the vivid colours of Michiel's painting 'transported from India to Spain' represented a serious attempt to bridge the gap visually.

There is an enigmatic detail that this folio does not share with any of the others. The sheet is torn along the bottom edge so that we do not know exactly what was depicted beneath the tree, but still visible is a cord-like vertical line connecting the base of the trunk with what looks somewhat like a cartoon version of the head of a dog. Consultation of an expert on Mexican codices revealed that it represents the dog-headed Mexican god Xólotl, depicted with a vertical black stripe running through the eye and an ear ornament (*nacochtli*). Whatever the function of this dog's head may be in the present case (it may be a toponym), the presence of an image of Xólotl on this page of the *Blue Book* is evidence that the original was painted by an indigenous artist in Mexico, even though its significance will have remained completely bewildering to the European copyist. This is perhaps what has preserved it for us, for in other cases the copyist may have simplified or suppressed the roots of the trees and any pictographic glyphs that may have been present because they were incomprehensible to him. Likewise, the lines of red ants that appear below a painting of a cactus in the Aztec herbal from 1552 known as the *Codex Cruz-Badianus* (written in Nahuatl by the native convert Martín de la Cruz in Tlatelolco and translated into Latin by another student at the college called Juan Badiano) are meant to indicate that the plant grows near anthills, but in reducing the number of ants to two, the artist of a copy of the codex made in Rome for Cassiano dal Pozzo in 1626–7 has rendered this detail meaningless. The history of the circulation of images is rife with such misunderstandings.

Stylistic comparison with other paintings done directly by indigenous artists or on the basis of their products in colonial Mexico (such as the *Codex Cruz-Badianus*, the *Florentine Codex* of Bernardino de Sahagún, or the *Relaciones geográficas*) points to the Valley of Mexico as the site of production of the originals from which Michiel's and Aldrovandi's copies were indirectly taken. The closest parallel is to be found in the decoration of the Convent of San Salvador in Malinalco, some 100 kilometres southwest of Mexico City, where cacao and several more of the trees and the fauna that eat their fruits (or one another) that we find in the *Blue Book* were painted on the walls. These parallels date from the last quarter of the 16th century, while the copies made for da Mula were done in the 1550s, but in a region where styles did not change overnight we should not shrink from comparisons between materials some two or three decades apart.

It is true that the cacao tree's primary zone was in the wet tropical lowlands of Yucatán rather than in the drier Valley of Mexico, but its presence in the Malinalco paintings and in the *Florentine Codex* is evidence that it was known in the Valley. Indeed, the small insect seen in the *Blue Book* image flying towards a flower that emerges from the trunk on the

[3] G.F. de Oviedo y Valdés, 'Prohemio', *Historia general y natural de las Indias*, J. Amador de los Ríos (ed.) (Madrid: Real Academia de la Historia, 1851), pt 1, book 10, 362.

Figure 2. Painted wall in the Convent of San Salvador, Malinalco, Mexico (photo by P. Mason, 2014).

lower right suggests that the painter was aware that cacao flowers are pollinated not by hummingbirds or butterflies but by small insects. Moreover, given the importance of cacao drink as a beverage and stimulant as well as its use in indigenous religious rites, it is unthinkable that the tree would have been unknown to an artist in central Mexico.

As for the date of production of the original paintings, once again the head of Xólotl affords a clue. Parallels exist in other Mexican codices, but one of the closest is in the *Codex Mendoza*, now in the Bodleian Library in Oxford. Antonio de Mendoza was viceroy in Mexico from 1535 to 1550; his son Francisco commissioned the *Codex Cruz-Badianus* around 1552 and took a lively interest in the acclimatisation of oriental plants in America for commercial purposes. It is not hard to imagine that Francisco de Mendoza would have shown particular interest in a group of images representing trees that produced edible fruit.

There is a further, Venetian twist to the tale. Francisco's uncle, Diego Hurtado de Mendoza, was appointed imperial ambassador to Venice in 1539, where he indulged in his passion for collecting books and manuscripts, including works on natural history and a herbarium (kept since 1576 in the Real Biblioteca del Monasterio de San Lorenzo de El Escorial). It seems plausible that the link between these 11 paintings produced in the Valley of Mexico and the arrival of copies of (copies of) them via Spain or Portugal in Venice, Bologna and Florence – 10,000 kilometres away from their place of origin – was the

Mendoza family. The lives and travels of images are fascinating enough in themselves, but the character, interests and activities of those through whose hands they passed are an important part of the story too. Their conscious or unconscious interpretations, their selective biases, their mental horizons all left their marks on the reception history of those images. Like so many other images of New World objects, Pier'Antonio Michiel's painted cacao tree in Venice and his comments on it bear the traces of those various hands.

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STRAWBERRY

Elisa Sevilla and Ana Sevilla

Figure 1. V. Albán, Native Nobleman of Quito in Festive Attire, *1783 (courtesy of Museo de América, Madrid).*

Although the very English custom of consuming massive amounts of strawberries and cream at fashionable Wimbledon might lead one to think otherwise, modern cultivated strawberries are not English, nor even European. The cultivated strawberry is the product of the labours of ancient Patagonian horticulturists and modern global networks of experimentation and knowledge production that linked Europe with the Americas. The juicy, plump modern fruit is a hybrid produced by crossing the wild 'scarlet' strawberry of eastern North America (*Fragaria virginiana*) with varieties of the cultivated

Chilean strawberry of the Andes (*Fragaria chiloensis*). The first such hybrid was produced in France in the 18th century. The French spy Amédée-Francois de Frézier visited Chile in 1714 and smuggled the *frutilla* grown in Concepción, introducing it into France, whence it travelled north to England. But Frézier only brought female plants, which of course did not bear fruit until they were planted next to the male Virginian species in Brest, producing the first hybrids. In 1766, royal gardener Antoine Nicolas Duchesne demonstrated that the strawberry plants were female, male or hermaphrodite. A century later, several new varieties were produced in Britain, only a few years before the first Wimbledon tennis tournament. Thomas A. Knight, president of the Horticultural Society of London, was the first to perform large-scale hybridisation experiments. Michael Keens developed a systematic method for cultivation. Isaac Anderson-Henry established important correspondence with gardeners and botanists who sent seeds from around the world, especially from Quito, to experiment on breeding programs. Joseph Myatt developed some of the more famous varieties in Britain, including 'Myatt's Pine', 'Eliza', 'British Queen' and 'Deptford Pine'.

The cultivation and hybridisation of strawberries produced an ongoing debate inside the British scientific and horticultural communities. The core of the discussion was anchored in the fact that European strawberries (*Fragaria vesca*) could not produce hybrids with the American species. This blind alley intrigued several horticulturalists and scientists, including Charles Darwin. Darwin used the example of the strawberry in *The Origin of Species* as an illustration of how fast humans will domesticate a crop if they value it, and to show that variability within a species is the material source of commercial variety production, arguing that 'as soon, however, as gardeners picked out individual plants with slightly larger, earlier, or better fruit, and raised seedlings from them, and again picked out the best seedlings and bred from them, then, there appeared (aided by some crossing with distinct species) those many admirable varieties of the strawberry which have been raised during the last thirty or forty years.' It was clear that the strawberry could shed some light on the mechanisms for creating species variability. Curiously, Darwin failed to acknowledge the foundational work of Andean peoples in this artificial selection process. But as the horticulturist T.A. Knight pointed out, abundant evidence supported the idea that the American forms spontaneously crossed over. Indeed, the reason for the explosion of varieties appeared to reside precisely in the promiscuity of the American strawberries. Knight concluded that the best existing varieties were an eventual product of such crosses. Later, the strawberry would be further hybridised and modernised in the United States in the 20th century by incorporating strains of the plump and durable 'Huachi' strawberry from Ambato, Ecuador, thus producing a highly mobile and attractive fruit.

The history of the modern strawberry's mobility is long and colourful. In 1783, the Quito painter Vicente Albán produced a striking series of six oil canvases portraying costumed locals in their natural environs consuming or peddling the region's fruits in what is today Ecuador. The fruits depicted included guava, several varieties of passion fruit, an Andean cherry called capuli, papaya, coconut, avocado, chirimoya, chilguacanes, chamburos, mameys, pitahayas, obos and a variety of plantains. But the most pervasive fruit in the series is the Andean strawberry or *frutilla*.

Vicente Albán's work provides a window not only into the bounty of Andean culture and nature but more precisely into the workings and aesthetics of the prolific Hispanic American Enlightenment, which in the late 18th century produced hundreds of such paintings and thousands of botanical, zoological and ethnological illustrations. These paintings were apparently commissioned by José Celestino Mutis, an Andalusian polymath from Cadiz based in what is today Colombia and at the time was the Viceroyalty of New Granada, which included Quito. In 1783, the paintings were sent to Spain, where they became part of the Royal Cabinet of Natural History (see 'Creole Cabinet' in this volume), and later the collections of the National Museum of Natural History, and still later the National Archaeological Museum, until finally arriving at their present resting place in Madrid's Museum of America.

The first painting in the series is entitled *Yapanga de Quito*, which may be translated as *Mestiza* or *Chola of Quito* (Figure 2). Like the others in the series, this painting is oil on canvas, measuring 109 × 80 cm. Here, Albán represents a *yapanga* surrounded by

Figure 2. V. Albán, Mestiza of Quito, *1783 (courtesy of Museo de América, Madrid).*

trees and fruits, with a numbered reference and brief description of each. In the lower left-hand corner, Alban paints a strawberry plant with a caption that reads: *'Arvolito que produce las Frutillas y son una especie de Fresas como las de España, pero mucho más gruesas y dulces'* ('Shrub that produces the *Frutilla* strawberry which is like the *Fresa* strawberries of Spain, only fatter and sweeter'). The strawberry plant is painted with detail, including the fruits, flowers and runners with their sterile and productive knots – a skilled demonstration of local botanical knowledge.

In *Indio principal de Quito en trage de Gala* (Figure 1), which may be translated as *Native Nobleman of Quito in Festive Attire*, an explicit aesthetic connection is made between the colourful attire of the local inhabitants and the colour and bounty of the fruits of the land. This aspect struck many European visitors to the New World during the period, including such figures as Jorge Juan and Antonio de Ulloa, distinguished members of the Franco-Hispanic geodesic expedition led by La Condamine, organised by the Parisian Academy of Sciences and sponsored by the enlightened Charles III, king of Spain and the Indies. Ulloa – who, like Mutis, hailed from Cadiz – described American fruits as 'monstrous' gifts of nature that graced the opulent tables of Quito's notables, be they Creole, mestizo or native. In this painting, the native nobleman of Quito holds a plate brimming with huge, luscious strawberries in one hand while he tastes one with his other hand. The white inside of the Ambato strawberry is clearly visible.

Although the 'scarlet' and Chilean strawberries grow wild in North and South America, only in the southernmost reaches of the Andes did the Picunche, Huilliche and Mapuche peoples cultivate the berry. In their language, the Mapuche differentiated the wild from the cultivated, naming the former *llahuén* and the latter *kellén*. According to the chronicle of Inca Garcilaso de la Vega, the Chilean strawberry or *frutilla de Chile* was brought to Peru as early as 1557 and to Quito sometime before 1573. This species was much bigger and sweeter than other strawberries, and it was also whiter and more durable and thus resistant to bruising. The native, sedentary peoples of central Chile cultivated this species of strawberry and consumed it fresh, dried or in a highly valued fermented drink called *lahueñe mushca*. The roots of the strawberry were also used as an abortive drug. During the early modern or colonial period, the Chilean strawberry was transplanted throughout South America, becoming a common orchard crop.

Figure 3. V. Albán, Native Woman in Festive Attire, *1783 (courtesy of the Museo de America, Madrid).*

The Chilean strawberries grew particularly well in the highlands of the equatorial Andes. They came to be known as the 'strawberries of Ambato'. In Ambato, the frutillas grew two or three times larger than elsewhere. Local lore claims that the strawberries were originally transplanted from Chile by José Antonio Blanco Antorvoz de Salinas. The process of adaptation must have involved an active selection by the peasants of the region, since the plants had to adapt to the very short photoperiods and constant low growing temperatures of the Ecuadorian highlands. By the 1920s, and unlike the wild and Chilean varieties, the Ambato plants had perfect hermaphrodite flowers, another indicator of the artificial selection process performed by Andean farmers.

In *India en trage de Gala* (Figure 3), which may be translated as *Native Woman in Festive Attire*, Albán exhibits the strawberries in a fruit basket. Here, a tropical bird feeding on the fruit reveals the white flesh inside. Again, the skill and knowledge of the painter is manifestly evident. It was this kind of skill and knowledge that produced the modern cultivated strawberry that could eventually be enjoyed courtside at Wimbledon.

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VOLCANO

Sophie Brockmann

A rather large and imposing 'object' of knowledge, Guatemala's Pacaya volcano looms over the country's central highlands. Situated near the former seat of the royal court of the Kingdom of Guatemala, now known simply as Antigua, it is a potent symbol of the region's geological and cultural dynamism. Indeed, a chain of dozens of active volcanoes of which Pacaya is part have shaped Guatemala's landscape and life for hundreds of years. A key moment in this long history occurred in 1773 when a massive earthquake destroyed Antigua Guatemala (Old Guatemala), provoking not only an assessment of the damage wrought but also a more general inquiry into the nature of volcanoes and natural risk. The city was still reeling from the effects of the 1773 quake when Pacaya erupted in 1775. In the wake of the 1773 disaster, the government in Guatemala had decided to move the capital to a new site in a nearby valley, called Nueva Guatemala (New Guatemala, today Guatemala City). Although the reasons for the move were as political as they were geological, the 1773–5 period of crisis represents an enlightening window onto the ways in which Spaniards, Creoles and Indians studied and responded to volcanos and their associated seismic risks.

Historians of science normally trace the emergence of seismology and volcanology to 19th-century Europe, and in particular to Italian volcanoes and the scientific work of Austrian and Swiss geologists. Middle and South American volcanoes are acknowledged, albeit only as an influence on those European scientists who travelled to them to collect data. Such textbook accounts tend to marginalise the cumulative knowledge of native and colonial actors in the Americas who had no choice but to consider these phenomena closely and, more pressingly, learn how to coexist with them both in moments of crisis and over the long run.

Following the 1775 eruption of Pacaya, for instance, functionaries based in Guatemala City collected over a hundred pages of reports from eyewitnesses. As in Europe, many of these eyewitness reports emphasised the frightening nature of the phenomenon. Based on documents culled from the government's archives, booklets were later printed explaining the great natural dangers of the region. For instance, the booklets listed the 14 major earthquakes that had befallen the city between 1531 and 1773 and major volcanic eruptions going back to the 16th century.

While the government's priority in this case was to establish the extent of damage to people and property, and to identify any ongoing danger, it was also clearly interested in understanding the natural phenomenon more deeply. During the 1775 eruption, for example, functionaries examined the relationship between Pacaya and other nearby volcanoes, especially Fuego. Were the two volcanoes connected? That is, if one of them erupted, was the other also likely to erupt? After all, new and frightening craters seemed to be opening up on the slopes of Pacaya by the day. The relationship between volcanoes and whether they were connected under the earth's crust by solid or molten flows of lava was at the time a key question that preoccupied European savants as well. José Maria Alejandre, an engineer who wrote the most in-depth report on the Pacaya eruption, answered the question thoughtfully. He could not be sure whether the volcanoes were connected below the surface, but the presence of hot springs between the two volcanoes certainly suggested that underground heat might connect the two. He had read the works of the Spanish polymath Fray Benito Jerónimo Feijóo (1676–1764), who had written about the eruption of the Sicilian volcano Etna. Although our author could not recall exactly in which part of Feijóo's learned works the reference to volcanoes was, he was certain that the phenomena he was observing were the same.

In addition to having read books on the matter, the engineer Alejandre could consider himself a specialist because he had empirically observed more than one of these eruptions. He was thus able to compare similar situations. Historians of science often make a distinction between sciences of the field and sciences of the cabinet and laboratory. Clearly, volcanic observation did not invite laboratory experiments. As in other field sciences, travel to compare different sites was very important. Over the course of his service, the engineer had travelled across Central America. There were, he pointed out, different types of volcanic eruptions across the region. This one at Pacaya, Alejandre assured his superiors, was of the type in which lava flows would eventually become solidified into something like the slag that smelting iron produced. He could be sure of this because he had observed a similar eruption of the Nindiri volcano in Nicaragua six years previously and because he knew of another similar volcanic landscape near the city of San Salvador.

Mexican scientist José Mariano Mociño also reported on a series of earthquakes in San Salvador. Mociño had studied the origins and consequences of a volcanic eruption at San Andrés Tuxtla in 1793 and was therefore considered an expert. Both Creoles emphasised the importance of not being blinded by fear. The 'secrets of nature' could be understood, but that did not necessarily mean that destructive events could be prevented. Nevertheless, volcano knowledge was 'very useful'.

The close study of the Pacaya volcano's eruption resonated across the Atlantic. The governor of Guatemala used the 1775 eruption as further evidence at Madrid to justify his support for the removal of the capital of the kingdom from its old site, Antigua Guatemala, to the new one, called simply Nueva Guatemala. One purpose of the report was to persuade King Charles III and the Council of the Indies that the new site for the capital was safer because it was further away from the Pacaya and Fuego volcanoes and separated from them by deep ravines. The decision to move the city was not just about risk assessment, however. Merchants who wished to upset the entrenched power of the old commercial families pushed for the change. Some individuals, such as the native engineer who built the new city's aqueducts, were able to build careers that might not have been possible in the old capital. Many poor people who could not afford to uproot their lives, by contrast, were left behind. Then as now, natural disaster could not be separated from social inequities and patterns of landownership. Indeed, the decision led Archbishop Pedro Cortés y Larraz to generate a discussion about the relationship between poverty and the effects of natural disaster.

Despite the political undertones, an awareness of natural risk came to influence various aspects of governance. Archbishop Cayetano Francos y Monroy, after travelling around his Central American parishes, suggested that churches should not be built in the same way that they were built in Europe. Heavy stone building materials were used for vaulted ceilings and columns, and as a result, church buildings across the bishopric regularly collapsed in earthquakes. The bishop recognised that (mostly indigenous) parishioners then spent years rebuilding them, only for the new church to be destroyed again. In a letter to the king, the bishop sought to shape policies that would foster more sensible building practices; at the same time, he also appealed to the crown's fiscal sensibilities. The tax money and tributary labour that currently went

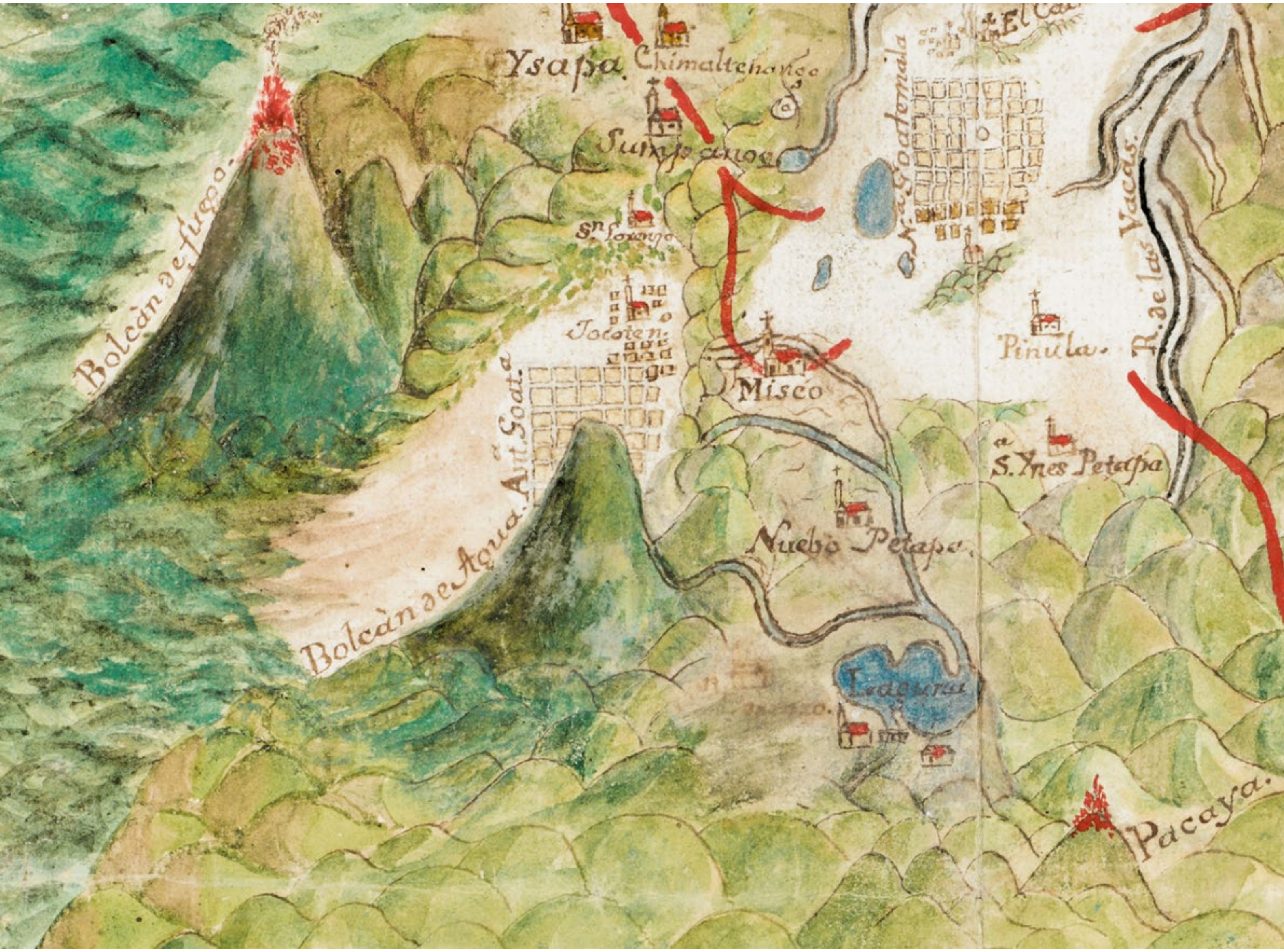

Figure 1. Map of Old and New Guatemala with volcanos (courtesy of the British Library).

into rebuilding the churches, he pointed out, could be used far more productively for other purposes. The archbishop suggested that churches should be of moderate height. They should have coffered rather than vaulted ceilings and use earthquake-resistant wooden pillars. This vanguard advice was not followed everywhere, but it did nevertheless represent a change of attitude that would soon resonate across the Atlantic world.

New building ordinances were put in place across Latin America and Europe in the 18th century to cope with potential natural disaster. In Lima and Guatemala City, wide streets and low buildings would prevent edifices collapsing onto each other. Buildings so adapted to their natural surroundings, as historians and archaeologists have pointed out, were not a novelty in Latin America. Aztec, Maya and Inca architects tended to design and construct buildings with fewer stories and lighter adobe or thatched roofs and very strong and wide walls, which were less prone to earthquake damage, and this clearly influenced colonial building practices, which in many ways were more environmentally sensitive than their European counterparts. Lima's building ordinances, for instance, were put in place ten years before Lisbon was rebuilt following its devastating 1755 earthquake. Although further research is required, given the circulation of knowledge between Iberia and the Americas, it is likely that the native and Creole volcano knowledge and experience of living with natural risk influenced the way that Lisbon and other earthquake-prone cities in southern Europe were rebuilt.

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ANDES

Jorge Cañizares-Esguerra and Mark Thurner

The Andes have figured prominently in the global history of knowledge, aesthetics, politics and mountaineering. Since the late 18th century, the massive Chimborazo volcano has served as a convenient metonym for the entire mountain range, and for good reason. Until the 1840s, Chimborazo was thought to be the highest peak on the planet. Although it was later demonstrated not to be so, due to the equatorial bulge Chimborazo's imposing summit is still the closest you can get to the sun on Earth.

As a paramount symbol of tropical wonder and the will to knowledge, Chimborazo beckoned savants, revolutionaries and artists, including Charles Marie de La Condamine in 1746; Carlos Montúfar, Aimé Bonpland and Alexander von Humboldt in 1802; Simón Bolívar in 1822; Frederic Edwin Church in 1853; and Edward Whymper in 1880. Although Whymper is credited with being the first to reach the true summit, like his predecessors who failed to reach the top he was led up the slopes either by local pastoralists, seasoned ice-collectors or guides. Archaeologists have identified on the expansive north-western slope remains associated with the early modern Chimbo and Guaranda chiefdoms, whose descendants inhabit the region today, and small propitiation sites indicate ancient human presence and belief at higher altitudes.

Since the early 19th century, the biogeographical concept of tropical verticality has been associated with the Andes and Chimborazo in particular, thanks in part to the worldwide circulation and fame of striking images of the volcano produced by Alexander von Humboldt and Aimé Bonpland (Figure 1). But contrary to common belief the concept was not invented or discovered by Humboldt.

Simón Bolívar, who claimed in his poem 'My Delirium on Chimborazo' to have surpassed Humboldt's footsteps on the slopes of Chimborazo, called his sometime friend and ally 'the discoverer of the New World'.[1] But it should be noted that the Venezuelan revolutionary did so for ideological or political reasons. The championing of Humboldt served a concerted republican effort to negate the formidable knowledge produced under enlightened Spanish rule. What Humboldt discovered in the New World was for the most part already existing knowledge, which the Prussian repackaged and sold to European and North American readers eager to learn about a land about which they knew very little.

The notion that ecological diversity or plenitude depended upon altitude rather than latitude was first articulated in print not by Humboldt but by Hispanic natural historians who lived in the Andes in the 16th century. These natural historians combined classical Aristotelian concepts with observations and existing

[1] S. Bolívar, 'Mi delirio sobre el Chimborazo' (1822).

Andean knowledge and practices of verticality that had long operated on a grand scale under the umbrella of the Inca state. Fully two centuries before Humboldt's expedition, South America was seen to be a providential space of natural wonder, a microcosmos endowed with all the climates of the world, and thus capable of giving birth to and nurturing any divine, natural or human being. This microcosmic tradition was the result of the early colonial meeting of Andean and Mediterranean concepts and experiences of clime and universal space.

In the 16th century, wayward Iberians had encountered high civilisations in the Andes that exhibited both uncannily familiar and notably distinct concepts and patterns of human and plant settlement. Although 'markets' or meeting places for the exchange of exotic goods existed in the northern Andes (today's Ecuador and Colombia), in the central and southern reaches of the expansive mountain range (today's Peru, Bolivia, northern Argentina and Chile) access to 'exotic' commodities produced in adjacent ecological zones was obtained via intricate networks of transhumant settlements occupying complementary ecological niches and exchanging goods produced or gathered in each niche. Seasonally migrant and resettled populations produced fissiparous communities deployed in what ethnohistorians have called 'vertical archipelagos' distributed up and down the Andean slopes to the west and east of the twin north–south ranges or *cordilleras*, thereby reaching down to the subtropical and tropical zones, both arid and humid, of the Pacific Coast and the Amazon basin. In the Andean valleys that lie nestled between the cordilleras, called Quechua in Runa Simi or the 'human tongue' of the region, the climate was temperate. Indeed, the word for 'temperate valley' came to be associated with the language of the Andes (although linguistic research suggests that its origins are in the Upper Amazon or *chawpi yunga* zone to the east of the cordilleras), and as a result, non-native speakers then and now call the language 'Quechua' or 'Quichua'. The Inca state was indeed centred on this Quechua climatic zone, but it extended far and wide in vertical fashion into adjacent *puna*, *chawpi* and *yunga* zones.

In the 16th century, theological and practical concerns of conversion and tribute collection stimulated the production of works of natural history and geography. Often based on official inspections or *visitas* and questionnaires, these works contributed to theoretical and practical knowledge of microcosmic tropical verticality. Colonial authorities took advantage of Andean spatial arrangements and calendrics for labour mobilisation to mines, farms and mills, and for the organisation of tribute collection and trade. The rich diversity of ecological niches and natural products described in these primary sources prompted early modern scholars to associate Peru or South America with the biblical Paradise. Paradise, it was thought, had once contained all the fauna and flora of the earth. In efforts to recreate this primeval space of Edenic bounty, Renaissance or early modern naturalists established botanical gardens and curiosity cabinets. In the early modern period of the first globalisation, mountains were second only to botanical gardens as sites for envisioning Paradise. Steep equatorial slopes with cascading microclimates that reproduced the conditions of the rest of the world, however, were not bygone prehistoric spaces. They could be found in South America. Columbus was perhaps the first to speculate that the verdant 'Indian' lands he had encountered across the sea had been home to the biblical Garden of Eden. Like his contemporaries, Columbus held that Paradise was at the top of an extremely tall mountain, the nipple of a breast-shaped peak that reached beyond the sublunary sphere. To be perfect, Paradise had to transcend the laws of physics, and in classical cosmology heavenly matter in the celestial sphere was not subject to change. Only above the spheres of earth, water, air and fire could the generation and transmutation of the elements be avoided.

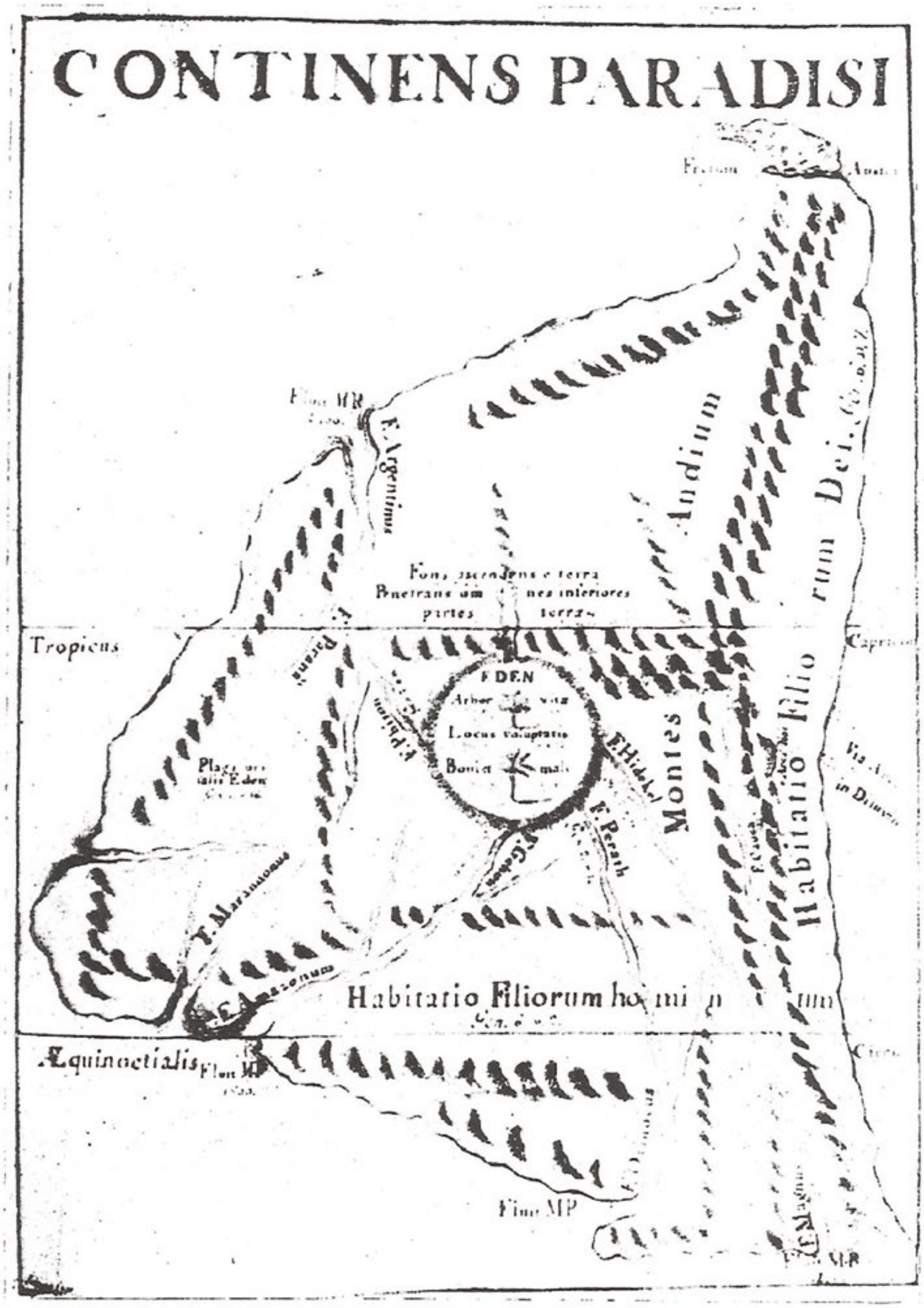
Modern Mediterranean soldiers and savants did not find peaks in the New World so tall as to be impervious to the laws of matter in the sublunary sphere. Nevertheless, they found in the Andes a means to explain why temperate climes appeared in the torrid zone when the ancients had predicted that this 'burnt zone' or *Perusta* (the Latin term found on medieval maps) would be uninhabitable owing to the scorching heat of the equatorial sun. Intrepid Jesuit naturalists who spent many years in the New World, such as José de Acosta, held the Andes in awe as they discovered that climate was as much a function of elevation and microclimate as it was of latitude. Although Acosta laughed at Aristotle, he and

Figure 1. A. von Humboldt and A.G. Bonpland, Geographie der Pflanzen in den Tropenländern, ein Naturgemälde der Anden *(courtesy of Staatsbibliothek zu Berlin, Kartenabteilung).*

many other Iberian savants continued to consult his meteorological concepts, particularly those relating to the spheres and vapours. Juan de Cárdenas, in his 1591 *Problemas y secretos maravillosos de las Indias*, and Bernardo de Vargas Machuca (1557–1622), saw the Andes as rising into the second sphere of cold air, where the intense rays of the equatorial sun produced vapours arising from shaded areas, shallow lakes and underground cavities, creating variable and habitable, often temperate conditions. Acosta further reasoned that the tropical oceans themselves, combined with winds, generated massive amounts of vapour that spread across the land, moderating temperatures there.

The first author to make an explicit connection between slope and ecological diversity was probably the Peruvian Creole Antonio de León Pinelo (1590–1660), who was educated in the Jesuit College of Lima before beginning a brilliant career in the imperial administration of the worldwide Hispanic realm in Spain. León Pinelo's *El Paraiso en el Nuevo Mundo: comentario apologético, historia natural y peregrina de las Yndias Occidentales, yslas y tierra firme del mar océano* sought to prove that Paradise had been located on the eastern slopes of the Andes (Figure 2).[2] León Pinelo's work grew out of his dissatisfaction with all the extant literature that had attempted to pin down the original position of the Garden of Eden. Ancient learned consensus held that Paradise had been situated somewhere in the Middle East or Asia. León Pinelo dismissed both new and old theories, arguing that the correct reading of Genesis placed paradise in the Andes. León Pinelo was sceptical that paradise could have been on top of a mountain, however, for life in the Andes proved that the thin air of very

2 A. León Pinelo, *El Paraiso en el Nuevo Mundo: comentario apologético, historia natural y peregrina de las Yndias Occidentales, yslas y tierra firme del mar océano* (Madrid, 1656).



Plano del Paraíso en la América Meridional según León Pinelo (fojas 126 del manuscrito).

Figure 2. Continens Paradisi. A. de León Pinelo, El Paraiso en el Nuevo Mundo: comentario apologetic, historia natural, y peregrina de las Yndias Occidentales, yslas y tierra firme del mar océano *(Madrid, 1656).*

high altitudes made breathing difficult and plant life scarce. Nevertheless, the Peruvian Creole maintained that of all places in the world, only the Andes could have reached the middle region of the sphere of air, where corruption and the transformation of the elements were considerably retarded. In addition, the Andes allowed him to explain how it was that a place near the equator, which should have been rendered uninhabitable by the scorching heat of the sun, was in fact the most temperate environment on earth. Andean heights offset the tropical position of Peru on the terrestrial sphere, yielding a perfect meteorological balance in the high valleys. León Pinelo identified three habitat zones in the Andes, each distinctively rich in its own way: the low-lying areas of the coastal plain and the Amazon basin, the mid-altitude plains or *llanos*, and the high-altitude sierras. León Pinelo's scheme drew upon Jesuit observations, but these were likely informed by Quechua classifications, which in most cases, then and now, named four zones: *yunga* or hot lowlands; *chawpi* or intermediate, subtropical slope; *quechua* or high temperate valley; and *puna* or cold alpine grassland or tundra. These altitudinal ecological niches or 'floors' rendered Peru particularly productive, for when one crop or fodder withered at one elevation, another flourished at another. The various niches also lent themselves to seasonal activities, including herding of livestock, fishing and hunting or corralling camelids. Its many microclimates across these zones made Peru hospitable to nearly all crops and products and to year-round productivity. Thus, whereas some American plants were not easily acclimatised in Europe, all European crops yielded harvests in Peru, claimed León Pinelo.

León Pinelo's natural history was chiefly concerned with cataloguing wonders and curiosities, not with thinking broadly about ways in which the microcosmic attributes of Andean space could be used to generate wealth. His forceful, patriotic and theological argument seemed disconnected from a discourse on political economy, perhaps because the economic concerns of his age were rather different. It fell to 18th-century Peruvian and European intellectuals to undertake this task in systematic fashion. But León Pinelo was not irrelevant to this enlightened effort. His manuscript, which included notes and maps, was carried to Spain by the Peruvian natural historian José Eusebio Llano Zapata, who would make it available to the transoceanic Bourbon project of political economic reform across the empire. A copy of León Pinelo's manuscript was made in Cadiz, and that copy rests today in the Royal Library in Madrid. A similar fate awaited that manuscript's enlightened purveyor, Llano Zapata, whose work was similarly archived and forgotten, in this case in the Royal Academy of History in Madrid, until it was recovered, properly identified and finally published in the late 20th century.

In northern and central Europe, so-called cameralist or statist discourses, often created and funded by princes, mining or engineering schools, academies and botanical gardens, sought to transform the polity into a self-sufficient economy. Carolus Linnaeus (1707–78), for example, deployed the ancient image of Paradise as an equatorial mountain to explain biodistribution and secure support for state-building projects. Linnaeus imagined Paradise to have been a very tall equatorial peak with a multitude of climates. The many microclimates of this mountain had once sustained all the fauna and flora of the world, he thought. As the oceans had receded, however, species had begun to colonise distant geographical regions, from the tropics to the Arctic, as they sought environments that resembled the niches in Paradise for which they had originally been designed. Linnaeus thus sent students abroad to collect flora in the hope of reassembling Eden and thereby weaning his polity from its dependency on imports. Trained naturalists would provide, through careful acclimatisation of exotic plants in botanical gardens, the raw materials needed for the Kingdom of Sweden to become an Edenic mountain in the north.

A similar cameralist discourse, in this case based in Saxony and Prussian Franconia and focused on mining as well as collecting plants, informed Humboldt and Bonpland's famous profile or vertical section of Chimborazo (Figure 1). Humboldt's field research practice connected underground (mining) and over-ground (botanical) mapping of natural resources, producing a penetrating vision of entire countries (in this case, Quito or Ecuador) as mines and agricultural zones that could be exploited by foreign interests.

Creole savants in the Andes did not have to send naturalists abroad to map and exploit such a wealth of resources, although they did sometimes benefit from expeditions from afar that they hosted and in some cases guided and, in others, purposefully misguided. Creoles could simply turn with renewed enthusiasm to the scientific study of the microcosm at hand, in the process often engaging and critiquing armchair European theory about the American clime. Unlike Linnaeus, however, most enlightened Creole intellectuals and political economists did not seek to make their kingdom's economies autarkic until after the wars of independence in the 1820s. In the 18th century, many sought instead to reinvigorate their rich kingdoms as emporiums of world trade within the increasingly free-trade-oriented Hispanic empire of the Bourbons, by exploiting more fully the microcosmic ecological and resource attributes of the Andes. A flurry of debates on how best to harness the riches of the Andes followed, with unprecedented investment in natural history and the subsequent dissemination of knowledge, on the part of both the Hispanic crown and the American viceroyalties, where venerable universities and academic societies were well established. Naturalists now sought to benefit the local and imperial economies by identifying new mines and mining technologies as well as botanical and agrarian products (dyes, spices, woods, gums, pharmaceuticals, llamas, vicunas, coca, cinchona bark, etc.) that could supplant those imported from Asia or monopolised by rival powers such as the French, Dutch and British and their Indies trading companies.

The microcosmic attributes of the Andes prompted Colombian savant Francisco José de Caldas to present New Granada as a natural laboratory for the study not only of natural products but of the microcosmic relations between behaviour, race and climate. In addition, New Granada (which then included Panama, Venezuela and Quito) was geographically privileged to be a world trade emporium, a new Tyre or Alexandria. The vast country was located at the centre of the world and equipped with navigable rivers to carry staples from the interior to the coast, as well as with ports facing both the Atlantic and the Pacific. Many of the efforts of the expedition of the Cadiz-born, New Granada–based botanist José Celestino Mutis, for example, were driven by the assumption that similar environments engendered similar botanical species and that the Andes constituted a treasure trove of microclimates, as Caldas had insisted. Thus, in 1785 Mutis claimed to have found in Colombia a substitute for Asian tea. He launched a campaign to convince imperial authorities that this Colombian product was as good as if not better than the tea Europeans consumed and were importing from China. Behind these efforts lay the idea that the Colombian Andes could furnish the world with all the products it desired.

Peru had always been a hotbed of natural historical and political economic thinking about natural and human diversity. Enlightened polymath José Hipólito Unanue (1755–1833), a member of the Lima academic society that edited the *Mercurio Peruano* (1791–5), author of the annual Statistical Survey of Peru under the viceroys, and Peru's first minister under San Martín and Bolívar, gave León Pinelo's old ideas of the Peruvian paradise a more rigorous, scientific foundation. Although Unanue was ready to note that 'God brought together in Peru all the productions he had dispersed in the other three continents . . . creating [in Peru] a temple for himself worthy of his immensity', he and his colleagues in Lima proceeded to document these productions in enlightened, scientific fashion, producing statistics, essays, maps, natural histories and learned treatises. Creole erudition at the centre of the Viceroyalty of Peru in the 18th century did not reduce the genius and diversity of the Andean world to a single mountain. Although Peru's fabled mineral wealth (above all, Potosí) and Inca civilisation were renewable themes, to demonstrate the country's native wealth, genius and universal potential, Peruvian intellectuals more often set their sights on the iconic but polemical figure of Manco Capac, the founding Inca emperor. Indeed, it would not be an exaggeration to say that Manco Capac was the ethnological 'Chimborazo' of the so-called dispute of the New World, a fierce debate about the origins and status of New World nature and civilisation. Most European savants speculated that Manco Capac must have been of 'foreign' origin (Voltaire thought he was an ancient white immigrant who arrived via the Canary Islands, much as Columbus had). Humboldt, on the other hand, traced the distant origins and 'laws' of New World civilization to Asia. On this score, Unanue clearly disagreed with, and indeed was far ahead of, Humboldt's thinking and that of the French philosophes.

Although it is surely true that Humboldt was deeply marked by his American voyage, many aspects of his thought are more readily traced not only to German cameralist mining discourse, as we have noted, but also to the neoclassical aesthetics of the German Enlightenment, with its notable Hellenophilia and its studied orientalism. This orientation, exemplified by the art historical thought of Johann Joaquim Winkelmann (see 'Xilonen' in this volume), generally held that the ancient Greeks were the measure of nearly all things, including race, beauty, civilisation and intellect; ancient oriental civilisation was also noteworthy for its great antiquity and because it was the likely point of origin of peoples and languages that later populated the West. For Humboldt, American civilisation was in most ways 'Asiatic' in style and spirit, and thus inferior to Western civilisation and its more refined, figural and individualist aesthetics. Humboldt thought its 'semi-civilisation' was probably derived from the ancient Orient via the migrations of Eastern sages to the New World. He thus speculated (and he was not alone in this) that Manco Capac, the first Inca, was likely a wandering Brahmin. Unanue was of a very different mind and aesthetic. For him, Manco Capac and his laws were demonstrably Peruvian, not Asiatic. He argued that only a native Peruvian genius could have designed such perfect laws for the land, in tune with its unparalleled natural and cultural diversity. Manco could do this because his nerve endings housed rapid-firing receptors whose sensitivity had been heightened by the equatorial sun and softened by the high-altitude, temperate clime of Andean South America. Unanue's physiological view that Manco Capac's genius was native to Peru was based on a science of Andean verticality. It was also a critique of Montesquieu's longitudinal environmental determinism (the notion that the civilisation and genius of whole regions were favoured or hindered by climes) and of European racialist thinking at large. In Unanue's words, modern Europeans had 'reduced genius to the curvature of the brow' based on a Greek model of perfection that had little or nothing to do with modern European or indeed ancient Greek reality. For Unanue, America, Africa and Asia were the true homes of civilisation, blessed by generous and diverse climes, whereas northern Europe was an upstart ingrate that now pretended to be 'the Tribunal of History' when in reality it owed the little civilisation it had to the Arab and Hispanic world of the Mediterranean.

Unanue's natural science and vision of history clearly distinguished him from Humboldt and most other European Enlightenment thinkers. Other Creole savants in the Andes held similar if less sophisticated views. Creole natural historical thinking in Quito, for example, came to focus on Chimborazo as a sign of its universality and sovereignty. A province and kingdom under the Incas that for a short time had been a northern capital of the crusading Inca Atahualpa, son of Huayna Capac, and then an *audiencia* or high court under the Peruvian viceroyalty based in Lima, Quito had become part of the Viceroyalty of New Granada in 1717. Nevertheless, local elites maintained a strong sense of its independence. Writing in the 1780s, the exiled Jesuit Creole Juan de Velasco argued that the Kingdom of Quito's natural sovereignty was evidenced by the fact that it was home to the world's largest bird (the condor), its widest river (the Amazon) and highest peak (Chimborazo). Bolívar continued in this Creole tradition in his famous 'My Delirium on Chimborazo'. Having ascended from the tropical river of Orinoco to the plant-free, eternal snows of the highest of mountains, he took poetic flight from this world, encountering the son of Mother Eternity herself, a god named Colombia. Descending back to his manhood, he resumed his struggle to liberate the earthly 'Colombia' (a gloss for all of America) from the vile Spaniards who still held Peru.[3]

After 1845, the topical or poetic elements of the old notion of Andean verticality present in the writings of Velasco and Bolívar would find their way into the design of the coat of arms of the Republic of Ecuador (Figure 3). Here the Amazon or Orinoco would be displaced by the Guayas River, marking the importance to Ecuador of the Pacific port of Guayaquil. The mighty condor and Chimborazo would continue to reign over the republic named after a precise line drawn by Enlightenment science. These native, natural symbols resonated with an intellectual tradition of tropical verticality that thrived long before Humboldt and continues to thrive today.

[3] S. Bolívar, 'Mi delirio sobre el Chimborazo' (1822).

Figure 3. The coat of arms of the Republic of Ecuador (public domain).

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ANTEATER

Helen Cowie

Figure 1. Studio of Rafael Mengs, His Majesty's Anteater, *1776. Oil on canvas (Museo Nacional de Ciencias Naturales; photo by H. Cowie).*

In the striking exhibit of the Royal Cabinet of Natural History in the Museo Nacional de Ciencias Naturales in Madrid hangs a portrait of a giant anteater (*Myrmecophaga jubata*) (Figure 1). This splendid painting, 1.05 m high by 2.09 m wide, depicts its monumental subject standing majestically in a mountainous landscape. The anteater's shaggy black tail billows out behind it and its long tongue protrudes from its tiny mouth, almost touching the ground. The insectivore's powerful foreclaws are clearly visible on its right foot, and it balances on its knuckles – an accurate representation of the way an anteater walks in the wild. A second anteater, smaller than the first, appears curled into a ball on the right side of the painting, its long snout tucked under its grizzled tail.

The portrait of the South American insectivore was commissioned by King Charles III and painted in the studio of the court painter Rafael Mengs. According to the inscription on the stone plinth to the animal's back, it was 'taken from life in the Casa de Fieras in 1776' when the anteater was 30 months old and still not fully grown. The painting thus represents the first living anteater to reach Europe, immortalising an exotic and little-known creature whose closest relatives are sloths and armadillos. It also depicts an animal that, in the late 18th century, would find itself at the centre of a heated scientific debate over the relative merits of New and Old World fauna.

The anteater depicted in the portrait arrived in Madrid in July 1776. It came from Buenos Aires and was sent to Charles III by the administrator of the city's postal service, Don Manuel de Basavilbaso. On its arrival in the Spanish capital, the anteater was introduced to the king, who inspected it in a chamber of the Palacio Real. It was then transferred to the Casa de Fieras in the Real Sitio del Buen Retiro, where a special apartment was created for it. A letter to Don Matías Martínez-López, dated 4 July 1776, recorded that the anteater was accompanied by a keeper, who had devised a special diet plan for the animal and would advise fellow keepers at the Casa de Fieras on how best to feed it. According to Spanish naturalist Félix de Azara, this consisted of 'little pieces of bread, minced meat and flour dissolved in water'.[1]

The anteater's first resting place, the Parque del Buen Retiro, was one of several royal menageries in 18th-century Spain catering to King Charles III's passion for exotic animals. Set close to the centre of Madrid, the menagerie functioned primarily as a site for entertainment and imperial ostentation, showcasing the various living gifts presented to the Spanish monarch. Along with other Real Sitios at San Ildefonso, Aranjuez and the Casa del Campo, it provided a home for an impressive variety of species, including an Indonesian elephant, presented to Charles III in 1773 by the governor of the Philippines, an African buffalo and a pair of Brazilian tapirs donated by the king of Portugal. It also housed various big cats, including a 'tiger cub' (jaguar), presented by the governor of Guayaquil in 1777, and a seal captured by fisherman off Alicante and exhibited in 'a box filled with water'.[2] Though it was created primarily for the king's pleasure, contemporary documents suggest that the Buen Retiro menagerie was open to the general public, allowing for wider contemplation of its inmates. In the case of the anteater, access to the public is not specified, but the buffalo was built a special enclosure with an iron grating 'so that the curious people of Madrid and other towns can see [it]'; the seal entertained *madrileños* by eating the fish they threw to it in its tub.[3] The living anteater may, therefore, have reached an audience beyond the monarch and his entourage.

The anteater's novel diet kept it alive for around six months. On 31 January 1777, however, Martínez-López wrote to the king's minister the marqués of Grimaldi to inform him that the animal had been 'found dead' in its enclosure. On hearing of the anteater's demise, Grimaldi arranged immediately for its corpse to be removed to the newly founded Cabinet of Natural History, or Real Gabinete de Historia Natural, in Madrid's Calle Alcalá, where it was stuffed by chief dissector Juan Bautista Bru and put on display in the nascent museum (see 'Creole Cabinet' in this volume). A series of entries in an account book for the Real Gabinete record the various stages in the anteater's transformation from cadaver to natural history specimen and the costs associated with each process: on 7 January, 'an expenditure of [several] reales' was made 'to bring an anteater that died in the Retiro [to the museum]'; on 13 February 'a porter was paid 2 reales for taking the flesh of the anteater to the countryside [after it had been extracted by Bru]'; on 25 June there was a payment 'of [several] reales for some hangers needed to place the [stuffed] anteater on its

[1] F. de Azara, *Apuntamientos para la historia natural de los quadrúpedos del Paraguay* (Madrid: Imprenta de la Viuda de Ibarra, 1802), vol. 1, 16.

[2] AGI, Indiferente 1549, 'Animales de Guayaquil'; 'Noticia de la loba marina que hay en el Buen Retiro', *Variedades de Ciencias, Literatura y Artes*, núm 12, 1805, 330–5.

[3] MNCN, Fondo Museo, Sección A – Real Gabinete, legajo 259; 'Noticia de la loba', *Variedades*, 330–5.

plinth'.[4] Within six months, therefore, the anteater went from royal pet to exotic museum object.

The anteater's posthumous home, the Real Gabinete de Historia Natural, assembled by its founding director, the Peruvian Creole Pedro Franco Dávila, offered a different environment for viewing the now-deceased insectivore. Founded in 1771 and opened to the public in 1776 – the very year in which the anteater arrived in Madrid – the Real Gabinete was accessible to visitors every Monday and could be visited free of charge. The German traveller Christian Fischer, who toured Spain in the years 1797–8, stated that the Real Gabinete was 'open two times every week, including for the common people dressed in ordinary clothes'.[5] The British traveller Joseph Townsend reiterated this view, remarking that 'any person who is decent in appearance is admitted to walk round the rooms'.[6] Conceived as part of a wider programme of support for the natural sciences (particularly botany), the Real Gabinete functioned simultaneously as a site for scientific study and a microcosm of Spain's imperial glory, holding treasures from across the globe. Colonial officials sent natural history specimens to the museum from their respective territories, and animal corpses also arrived from the Buen Retiro and other menageries. The anteater, one of the first creatures to be immortalised in this way, was among the most prized objects in the nascent museum and attracted the attention of several visitors, among them the Briton John Talbot Dillon, who marvelled at its 'worm'-like tongue.[7] It was later joined in the cabinet by the skeletons of a male and female anteater (1789) and 'a recently born anteater' sent to the museum by the Bishop of Trujillo, Baltasar Jaime Martínez Compañón. Martínez Compañón also sent a fabulous watercolour of a living anteater, busily foraging for insects (Figure 2), and the stuffed cadaver of an adult anteater, its tongue packaged

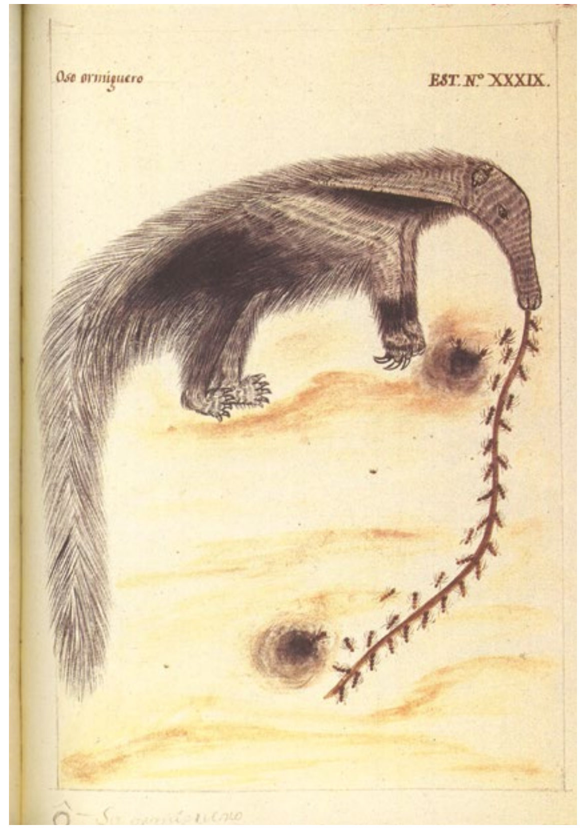

Figure 2. 'Oso hormiguero', from Trujillo del Perú, *vol. 6, plate 39 (courtesy of Patrimonio Nacional).*

separately and 'wrapped in paper' to avoid damage during transit.[8]

As well as appearing in a royal menagerie and a royal natural history cabinet, the Madrid anteater generated two notable artistic representations that outlived its physical body, either living or stuffed. The first of these was the official portrait of the animal commissioned by Charles III, which now hangs in the MNCN (Figure 1). Painted from life, this image captured the anteater's distinctive silhouette three months after the animal's arrival in Spain. It sought to highlight the insectivore's most unusual features, and, to this end, depicted the beast in two different poses, standing and snoozing. Though the painting was originally attributed to Rafael Mengs, its authorship is now uncertain and has been the subject

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[4] MNCN, Fondo Museo, Sección A, Real Gabinete de Historia Natural, legajo 280.

[5] C.A. Fischer, *Voyage en Espagne aux années 1797 et 1798* (Paris: Cramer, 1801), 41.

[6] J. Townsend, *A Journey through Spain in the Years 1786 and 1787* (Dublin, 1792), 180.

[7] J.T. Dillon, *Travels through Spain, with a view to illustrate the Natural History and Physical Geography of that Kingdom* (London: G. Robinson, 1780), 76–7.

[8] MNCN, Fondo Museo, Sección A – Real Gabinete, legajo 73.

of scholarly debate. Recent research suggests that it may in fact have been executed by the famous court painter Francisco de Goya y Lucientes, who worked as an apprentice in Mengs's studio during this period and could potentially have painted the animal.

The second image (Figure 3) of the Madrid anteater was produced by the Real Gabinete's chief dissector, Juan Bautista Bru, and featured in his 1784–6 book *Colección de láminas: que representan los animales y monstruos del Real Gabinete de Historia Natural*. Evidently painted from the stuffed rather than the living specimen, this plate shows the animal standing stiffly on a piece of generic turf, with one foot raised to better display its powerful digging claws. A scale above the image indicates the beast's real size, and a short paragraph on the adjoining page provides a textual description of the 'Osa Palmera', describing its 'very long snout', toothless mouth, 'small eyes', 'long cylindrical tongue' and 'curved claws'. The text also references the anteater's habits and movements, stating (inaccurately) that 'it climbs with great nimbleness in the trees' (probably a confusion with its arboreal cousin the tamandua) and that its flesh, though foul-smelling, is eaten 'with relish' by the 'savages' of Brazil.[9] Taken from a dead rather than a living animal, Bru's anteater displays a slightly stilted and contrived posture, which highlights the difficulties of painting animals from stuffed specimens. A painting in such circumstances could only be as good as the original taxidermy and might well perpetuate any errors made by the taxidermist, particularly if the latter had never seen the animal alive.

Figure 3. 'Oso Palmera', from Juan Bautista Bru de Ramón, Colección de láminas: que representan los animales y monstruos del Real Gabinete de Historia Natural, *vol. 2, plate 53 (Madrid: Andrés de Sotos, 1786; courtesy of Patrimonio Nacional).*

As well as functioning as an exotic treasure in European collections, the anteater served as a point of contention within two related debates concerning the nature of the New World and the relative value of observations made in the museum and in the field. The first of these debates, referred to by Antonello Gerbi as 'the dispute of the New World', centred on the comparative merits of New World versus Old World plants, animals and people. Initiated by the French naturalist Buffon, who claimed that the New World was colder and more humid than the Old World and its fauna correspondingly smaller and weaker, the debate gained traction in the 1770s when Prussian philosopher Cornelius de Pauw wrote a polemical book depicting America as a degenerate continent, filled with noxious insects and 'pusillanimous' lions (pumas). This contention aroused the indignation of American Creoles, who questioned the validity of such claims and the assumptions that underpinned them.

The anteater featured prominently in this transatlantic tussle, appearing in the writings of both America's detractors and its defenders. De Pauw, listing the defects of New World mammals, singled the

[9] J.B. Bru, *Colección de láminas que representan los animales y monstruos del Real Gabinete de Historia Natural de Madrid* (Madrid: Andrés de Sotos, 1786), vol. 1, 35–6.

animal out as degenerate on account of its unusual physique – in particular, the fact that it sported different numbers of toes on its fore and hind feet. On the other side of the debate, the Chilean Jesuit Juan Ignacio Molina rallied to the anteater's defence, suggesting that its negative image was a product of flawed and misleading naming practices.

> A very respectable modern author [De Pauw] who believes the degeneration of the animals of America to be evident, cites as proof of his opinion the American *myrmecophaga*, vulgarly called *ant-bear*, denigrating it as a degenerate branch of the bear species. But since all naturalists agree that this small quadruped differs from the bear not only in genus, but also in order, there is no reason to regard it as a bastard variety of a species with which it has never had the slightest affinity.[10]

The anteater thus appeared in Madrid at a time when its species was under scholarly scrutiny and became the focus of both critics and defenders of American fauna.

The 'dispute of the New World' fed into a deeper discussion of the credibility of different naturalists and the epistemological value of evidence gathered in different places. Should one put more trust in the museum-based scholar, who could inspect dead animals at close quarters, or the travelling naturalist, who could observe his subjects in their natural habitat but might only do so fleetingly and at a distance? Again, the anteater offered a prime example of these contrasting approaches, receiving different appraisals from sedentary and field-based scholars. Buffon, who had only examined dead anteaters in museums, claimed that their hind legs were thicker than their forelegs, that they used their claws to climb trees and that they resembled foxes when seen from a distance. The Spanish solider Félix de Azara, however, who had spent 20 years watching live anteaters in Paraguay, insisted that all the above claims were incorrect. Drawing on personal experience and local knowledge, Azara described how anteaters 'walk very deliberately, almost kissing the ground', how they

Figure 4. 'Le Tamanoir', from G.L. Leclerc de Buffon, L'Histoire Naturelle, *vol. 11, plate 29 (Paris: Imprimerie Royale, 1764).*

give birth to a single pup each year, which 'rides on the back of the mother', and how their fat was used 'to good effect' in Paraguay to 'cure sores on horses' [backs]'. He also criticised Buffon's illustration of an anteater in his *Histoire Naturelle* (Figure 4), which 'narrows, stretches and disfigures the head so much that it no longer resembles that of the beast'.[11]

Azara's comments reflected the differing perspectives of metropolitan and colonial scholars, who had different resources at their disposal. A long-term resident of Paraguay, Azara knew how anteaters moved and behaved in the wild and how local people treated them, but did not know how to classify them according to the latest European systems (he in fact referred to the giant anteater under its Guaraní name – *yurumí*, or 'small mouth', which he believed suited the beast). Buffon, on the other hand, located

[10] J.I. Molina, *Compendio de la historia geográfica, natural y civil del Reyno de Chile* (Madrid: Sancha, 1788), 304.

[11] Azara, *Apuntamientos para la historia natural*, vol. 1, 61, 62, 67 and 73.

in Paris, had all the latest scholarship at his fingertips but based his illustration on a disfigured museum specimen and his description on second-hand reports. These divisions were illustrative of a wider tension between European and American naturalists, who prioritised different forms of knowledge and wielded different types of authority.

Today, these controversies have largely been forgotten, and the specimen that provoked them no longer exists. The anteater's portrait, however, remains hanging in the Museo de Ciencias Naturales's 20th-century reconstruction of Franco Dávila's cabinet, a reminder that the 'dispute of the New World' has indeed left its mark on art, science and museography.

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MEGATHERIUM

Juan Pimentel

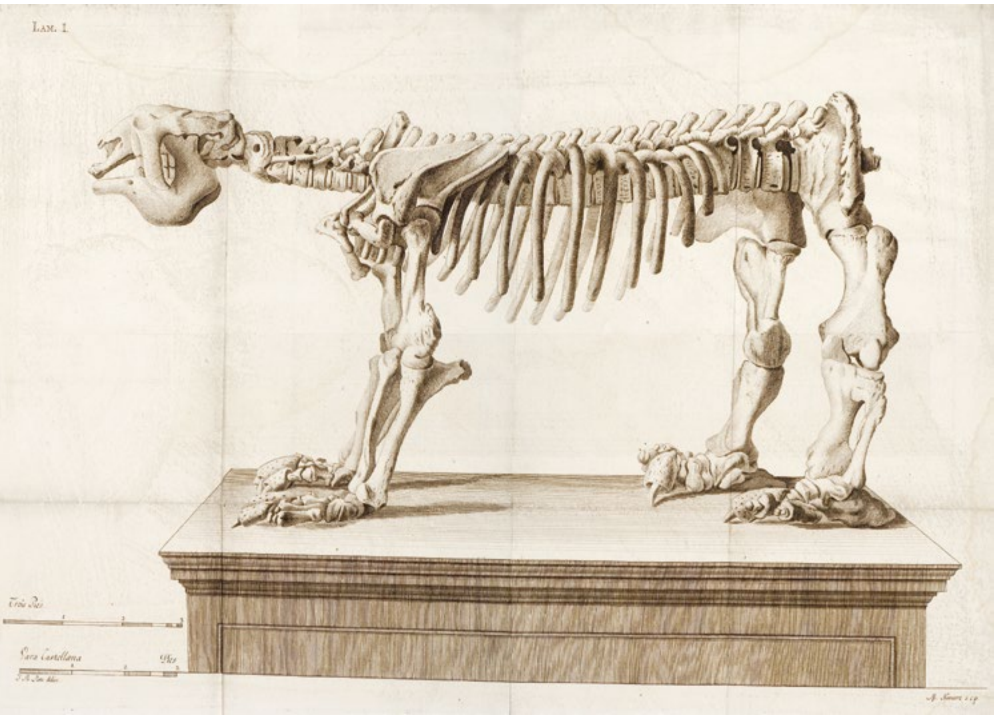

Figure 1. J.B. Bru and M. Navarro, in J. Garriga, Descripción del esqueleto de un cuadrúpedo muy corpulento y raro…, *plate 1 (Madrid: Viuda de Ibarra, 1796).*

The megatherium in the National Museum of Natural Sciences in Madrid is quite unique in the world, because it is the first reconstruction of a large extinct vertebrate in any museum. The story of how it was exhumed, drawn, mounted and finally identified lies somewhere between forensic anatomy and guesswork, rather like a jigsaw without an illustration as a guide, or a Rubik's cube without instructions. It was the time of the French Revolution. Palaeontology was taking its first steps. The history of life did not yet exist. That of the Earth was beginning to emerge, in all its vastness, the depth of time. The case soon awoke the interest of naturalists of both worlds, becoming an object of global knowledge, able to connect debates and arguments from Buenos Aires to Paris and from Madrid to London and Virginia.

The discovery took place in a ravine of the Luján River, a tributary of the Río de la Plata or River Plate. At the beginning of 1787 Manuel de Torres, a Dominican friar keen on natural history, unearthed some bones of what looked like a strange animal of great dimensions, a 'wonder and providence of the Lord', in his own words, a description echoing the tradition that linked monsters with divine plans. Aware of the value of the piece, the viceroy of Río de la Plata, the marquis of Loreto, ordered it removed to Buenos Aires. There it was drawn by a cartographer of Portuguese origin, José Custodio Sáa y Faria. First he drew the different separate bones, as in anatomy textbooks, showing the powerful spine, the head and two limbs, one foreleg and one rear leg, both very powerful. And then he ventured to recreate its form, a very risky exercise, since neither he nor anyone else knew what animal it was. The shape he gave it appeared equine, in a rigid posture, on its four legs. But the caption to this second drawing confirms the doubts: was it an amphibian or an aquatic animal? An elephant or a rhinoceros? The viceroy even summoned local *caciques* or chiefs to ask if they had heard of any similar living specimen in the region. The world still held unknown phenomena. The plains and pampas were largely unknown territories, not to mention Patagonia, a desolate land of legendary giants.

The Royal Cabinet of Natural History of Madrid had been founded only a decade before, thanks to the acquisition of the collection of Pedro Franco Dávila, a native of Guayaquil who had lived in Paris before coming to Madrid to direct the Royal Cabinet (see 'Creole Cabinet' in this volume). The institution was now looking for pieces and natural curiosities, filling its rooms with products and examples from Spain's huge and diverse possessions abroad. The marquis of Loreto sent the bones of the unidentified beast. After crossing the Atlantic, contained in seven crates, the bones arrived at the cabinet in Madrid.

Once unpacked, from the end of 1788, Juan Bautista Bru, the cabinet's taxidermist and painter, directed two projects that would ensure that the strange monster from Luján became more widely known. First was the assembly of the skeleton for its public exhibition in the cabinet. Then, a notable description was published in collaboration with engineer Joseph Garriga that included splendid engravings by the artist Manuel Navarro: the *Descripción del esqueleto de un cuadrúpedo muy corpulento y raro, que se conserva en el Real Gabinete de Historia Natural de Madrid* (*Description of a Very Corpulent and Strange Quadruped, preserved in the Royal Cabinet of Natural History in Madrid*).[1]

The exhibition of the monster of the Luján River standing on a pedestal in the Royal Cabinet and the publication of images enabled it to circulate in the public sphere, a basic requirement of enlightened science. As in the Buenos Aires drawing, the taxidermist must have been thinking of an equine or perhaps a feline of great size: standing on its four limbs, its posture – unaltered today in the National Museum of Natural Sciences (MNCN) in Madrid – is very rigid. Bru is known to have cut and glued bones without great compunction, even adding the tail of a mule that, later, he removed.

The identity of the monster was a mystery. The morphology of the blunt head was fearsome. From its powerful jaws rose a molariform dentition, no doubt that of an herbivore. However, the limbs ended in sickle-shaped claws, sharp nails that looked like those of a carnivore. Now, where had a quadruped about five metres long ever been seen with claws and without fangs? Its anatomy suggested the mythological chimaera (a term used today for errors of interpretation, in particular when an extinct organism is identified from two or more fossil elements of different species) – this mythic beast had the head of a lion, the body of a goat and the tail of a dragon.

Its skull, noted Bru, suggested an 'unspeakable monstrosity'. To look at it was 'an eye-catching

[1] J. Garriga, *Descripción del esqueleto de un cuadrúpedo muy corpulento y raro, que se conserva en el Real Gabinete de Historia Natural de Madrid* (Madrid: Viuda de Ibarra, 1796).

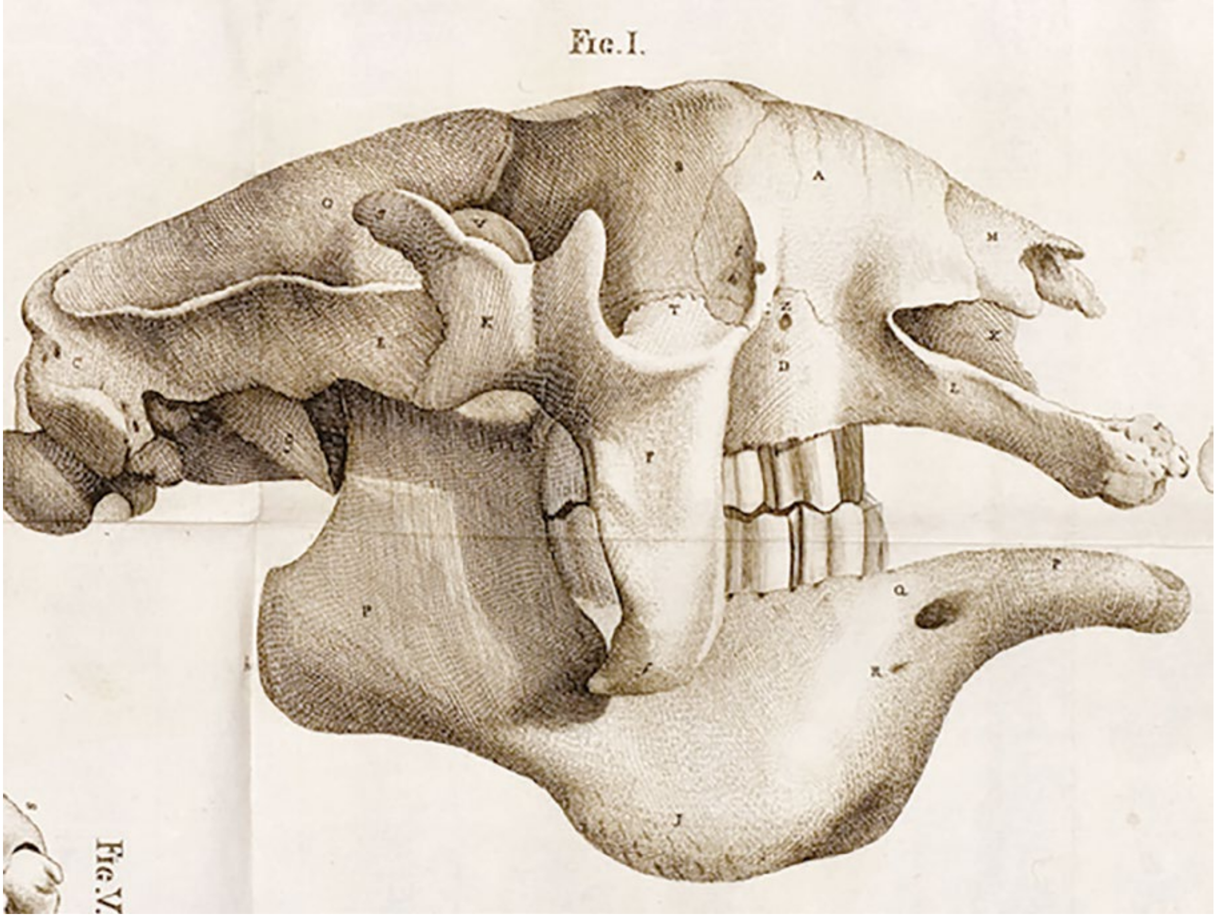

Figure 2. J.B. Bru and M. Navarro, detail of plate 2, in J. Garriga, Descripción del esqueleto.

spectacle', something 'astounding and remarkable'. It provoked agreeable shudders, reminiscent of the 'pleasing kind of horror' described by Joseph Addison in *The Pleasures of the Imagination*.[2] The elevation of its bones, the spaces they formed, evoked the view of a 'range of mountains seen from afar, on a clear and serene day when the horizon is clear of clouds'. It is the idea of the terrifying sublime, the sensation awakened when contemplating a precipice, a ruin or a cemetery. There was something of all this behind this massive skull that, in a way, was an authentic zoological *vanitas*, a vestige of a notion of 'deep time' that was only then emerging into scientific consciousness.

Before Garriga and Bru published the description of the skeleton, two foreign visitors to the Royal Cabinet had been fascinated by that 'unspeakable monstrosity'. They reported its existence from afar, drawing upon or copying Bru's preparatory sketches. One of these visitors was a Caribbean diplomat in the service of the directorate, Philippe-Rose Roume, who in 1795 was in Madrid negotiating the transfer of Santo Domingo from Hispanic to French dominion. He got hold of some copies of the prints that Bru and Navarro were then preparing and quickly sent them to the Museum of Natural History in Paris, where a brilliant young naturalist was about to solve the case without leaving his studio. There he had all he needed.

[2] J. Addison, '*The Pleasures of the Imagination*: Joseph Addison, from *The Spectator* (1712)', A. Jenkins (ed.), *Michael Faraday's Mental Exercises: An Artisan Essay-Circle in Regency London* (Liverpool: Liverpool University Press, 2008), 239–42.

The young man in Paris was Georges Cuvier (1769–1832), the epitome of the cabinet naturalist. Unlike the travelling naturalist who sought direct knowledge of nature in the field, Cuvier's knowledge was grounded in distance, study, abstraction and analogy. Celebrated years later as the father of comparative anatomy and vertebrate palaeontology, Cuvier's method of identifying the Luján River skeleton heralded a new way of approaching the study of fossil remains. Without visiting Madrid, without observing the animal *ad vivum*, looking at the copied images of Bru and Navarro and working in the collection of skeletons in the Natural History Museum of Paris, perhaps the most complete collection of vertebrates of the time, Cuvier avoided the major obstacle, the greatest source of confusion: size. On paper, the problem of size vanished or was at least minimised. It no longer tricked the viewer. It is much easier to see similarities of form if one forgets dimensions. In no time Cuvier realised the affinities between the Río de la Plata skeleton and those of the much smaller edentates (Xenarthra), a family of animals that includes pangolins, armadillos and sloths.

A sloth of more than five metres? Only the edentates combined such dentition (no enamel, continuous growth, molars without incisors) with those non-ungulate limbs and powerful claws that for others had been so confusing. Cuvier published an article with these conclusions at the beginning of 1796. He baptised the specimen *Megatherium Americanum*, the 'great American beast', affirming that the skeleton belonged to a vanished animal, different from anything living today. The American beast came from an ancient world (*ancien monde*). But how ancient? And how different was this ancient world from our own?

The megatherium was one of the first in a long list of inhabitants of a lost world. The list did not yet include dinosaurs but instead the Siberian mammoth, the American mastodon, the Maastricht animal and the marsupial of Montmartre. Cuvier defended the theory of catastrophism, the idea of the existence in the remote past of one or several great crises of nature that had given rise to new worlds and different species. This theory was opposed to Charles Lyell's uniformitarianism, the idea that the same conditions and alterations in Earth's past were ongoing today. Lyell's was a fundamental idea for the theory of evolution and natural selection. And yet, when Cuvier put into practice the correlation of the parts of the organism and the subordination of characters (in other words, applied the notion that all the organs and their parts are related to each other and depend upon the functions each performs), thereby applying the same laws for the study of living animals as for extinct ones, he paradoxically contributed to unifying the ancient world with the present one. The history of the Earth was freeing itself from the biblical story. There now arose a series of questions about the relationship between living beings and extinct ones.

Cuvier's publication had precipitated that of Bru and Garriga, which included the splendid engravings the sketches for which had been made available to Cuvier. In the *Descripcion*, the authors commented upon Cuvier's contemptuous attitude toward Spanish and Spanish American science. A vile Frenchman had scooped them. The case was another episode in the so-called Black Legend or negative stereotype of Spanish and Spanish American science cultivated in northern Europe, where Spain and its empire were frequently dismissed as backwaters of ignorance.

But the megatherium would have other afterlives. Before Roume had informed Cuvier of the find with copies of sketches, another diplomat had visited the Royal Cabinet of Madrid. His name was William Carmichael, and he was the representative of the nascent United States in Spain. After seeing the unidentified skeleton in 1789 while it was still in the process of being mounted, he informed Thomas Jefferson, then in Paris as plenipotentiary minister. He must have included some drawings. The author of the Declaration of Independence was more than just a natural history buff. He was very interested in fossil remains. Years before, he had dealt with the so-called beast of Ohio, the American *incognitum*, a species initially confused with the mammoth but which turned out to be another pachyderm, the mastodon. Engaged in heated debates about the nature of the New World, Jefferson defended its strength against the attacks of French, Dutch and

British naturalists, who considered it to be inferior to and weaker than the Old World. When Jefferson received the reports from Madrid, he cannot have paid them much attention. In that year the French Revolution erupted. But in 1797 more remains appeared in his native Virginia. This time it was a *Megalonyx* ('large claw'), a northern relative of the megatherium of the Río de la Plata. For a moment Jefferson thought that a feline of this size, a terrifying carnivore, could vouch for the vigour of the New World. It must therefore have proved disappointing for him to read Cuvier's article, where 'the great American beast' was identified as a sloth, the most abject animal in Creation, according to Buffon, whose theory of New World inferiority was the great scourge of American patriots.

The utility of the megatherium did not stop there. The beast had been used to demonstrate catastrophism, the extinction of certain species and the dignity of Spanish and Spanish American science and was nearly recruited in the American campaign to defend the nature of the New World from Eurocentrism. Goethe now used the beast to sketch an idealised evolutionary history, identifying it as the descendant of a sea beast that had had to adapt to the primeval swamps. The epigeneticist and embryologist of Russian origin Christian Pander had it as a subterranean beast, a root digger supported by its two forelimbs, as illustrated by his collaborator, the German naturalist and engraver Joseph W.E. D'Alton (Figure 3). The Reverend William Buckland, a firm advocate of natural theology, used D'Alton's image and assigned the megatherium a prominent role in making manifest the infinite wisdom of the Creator. Its 'extraordinary deviations', its 'egregious monstrosity', were in accordance with its behaviour and eating habits. The megatherium recovered the role of monsters in the ancient world: to demonstrate the divine plans of Providence.

It was Richard Owen who in the 1830s finally stabilised the species and assigned it a skin or fur. The megatherium differed from the glyptodon. It was not a *Dasypus* but a *Bradypus*, a species more like the sloth than the armadillo. It probably adopted a sitting posture and was occasionally close to bipedalism. Supporting itself on its forelegs, it used the hind legs to reach the branches of trees. This is how the megatherium is displayed today in the natural history museums of Paris and London. In Argentina it constitutes a national emblem and relic, a native species that played a prominent role in the establishment of Argentine palaeontology via the work of Florentino Ameghino toward the end of the 19th century. Meanwhile, the megatherium of Luján is still held today in the National Museum of Natural Sciences in Madrid, heir to the Royal Cabinet first assembled by the Peruvian Creole Franco Dávila. It remains an object of global knowledge, albeit now as a key to unlocking a lost history of science that connected Argentina with Madrid, Paris and Philadelphia.

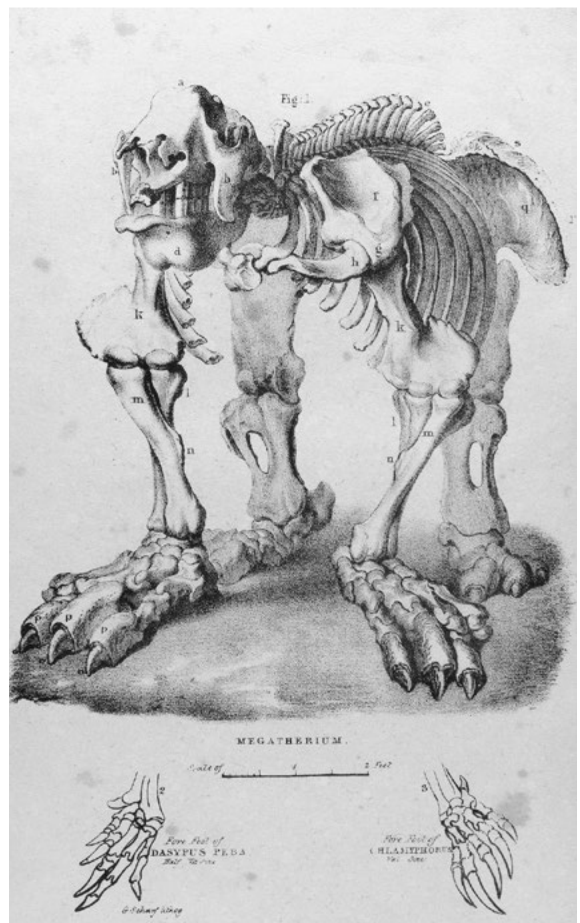

Figure 3. The megatherium, drawn by D'Alton, in W. Buckland, Geology and Mineralogy Considered with Reference to Natural Theology *(London: William Pickering, 1836).*

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TAPIR

Irina Podgorny

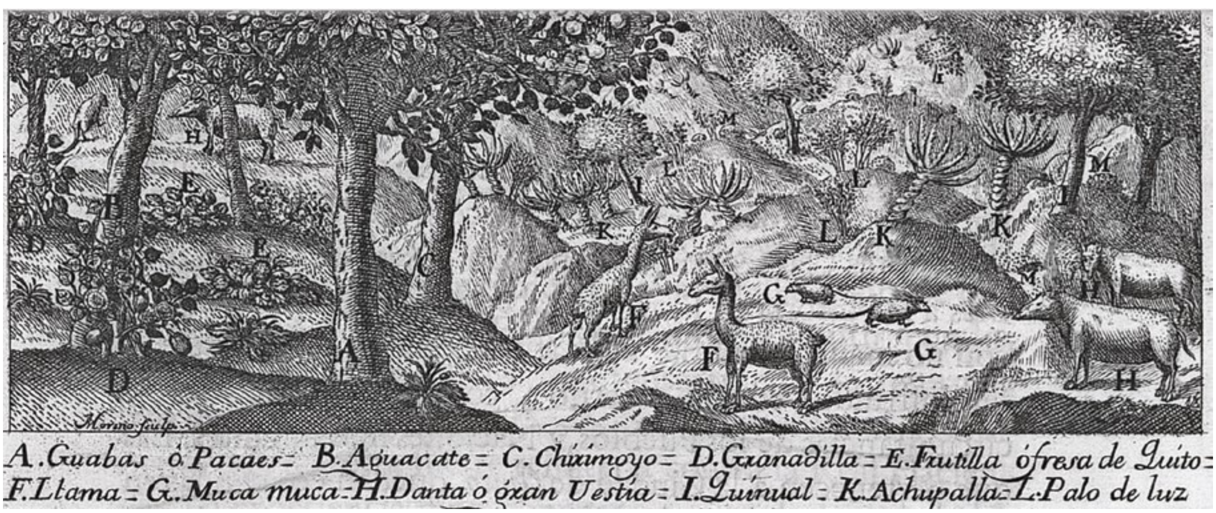

Figure 1. Plants and animals of Ecuador, A. Ulloa, Relación histórica del viage a la América meridional . . . primera parte, tomo segundo *(Madrid: Antonio Marin, 1748; courtesy of the John Carter Brown Library).*

'Tapir' is a name taken from Tupi, the native lingua franca used in the Portuguese New World dominions. Today this name covers five extant species, including one from Malaya. Whereas the name 'tapir' was first used in manuscript and print in the second half of the 16th century, the Spaniards had seen and mentioned the animal that the Tupi word named before, comparing it with cows, tigers and asses; in such analogies it was called *vaca* (cow), *vaca montés* (forest cow), *tigre danta* (danta Tiger), *vaca danta* (danta cow), *sachavaca* (jungle cow), *vaca mocha* (wild cow) or *anteburro* (anta donkey). Apparently, it was first seen by Spanish navigators Martín Fernández de Enciso (*c.*1470–1528), Alonso de Ojeda (*c.*1468–1515) and Diego de Nicuesa on their expedition to the Isthmus of Darien (Panama) from 1509. In 1514, Peter Martyr (1447–1526) future chronicler of the Council of the Indies in Spain, described the strange animal in these terms:

> But there is especially one beast engendered here, in which nature hath endevoured to

> shewe her cunnyng. This beaste is as bygge as an oxe, armed with a long snoute lyke an Elephant, and yet no Elephant. Of the colour of an oxe and yet noo oxe. With the house of a horse, and yet noo horse. With eares also much lyke unto an Elephant, but no soo open nor soo much hangying downe, yet much wyder then the eares of any other beaste.

Enciso in his *Suma de geografía* named the animal *vaca mocha* (behorned cow), a name that according to the Cuban intellectual Juan Ignacio de Armas (1842-1889) was later adopted by other Spanish authorities.[1] In 1526, the Spanish explorer of North America Lucas Vázquez de Ayllón (*c.*1475–1526) first observed the American moose or elk, calling it *danta*. In the same year, Fernández de Oviedo in his 1526 *Natural History of the Indies* recorded what seems to be the first transfer of an Old World name to the tapir. Oviedo remarked that the Spaniards from Tierra Firme or mainland South America had been using 'danta' to refer to an animal that the natives called *beori* for the quality of its hide. 'But they are not dantas', Oviedo underlined. That appellation coexisted with other native names, such as *vagra* (Peru), *maipouri* (Guiana) and *mborebi* (Paraguay).[2]

As early as the 1520s, Spaniards and Portuguese started calling two New World animals – the moose of North America and the tropical tapir – *anta, adanta* or danta, which were names for the elk of the Old World. In turn, that name had been the eventual result of a late medieval transfer of words and properties of African animals to rather distinct ones of Northern Europe. 'Anta' and the several versions of this word derived from the Arabic *lamt* or *lamta*, which denoted the oryx of the Sahara, a kind of 'antalope'. Arab geographers referred to the large Berber tribe of the Lamta, who were particularly famous for the light and solid shields they made from an animal of that name. These prized hides were offered to the kings of the Maghreb and al-Andalus.

The transfer of names, virtues and objects happened more than once and involved regions far beyond the Americas. Through a process that involved comparison, analogy and translation, the fauna and flora of the Americas were incorporated into a novel ordering of knowledge and representation where, as Michel Foucault noted, names were an inherent element of things.[3] In this order of words and things, large animals from different regions of the globe were subsumed under the name of the 'great beast', a source for a remedy against epilepsy.

Also known as the falling sickness, epilepsy, characterised by sudden convulsion and seizures, was one of the world's most intriguing maladies. The nature of epilepsy, often seen as mystical, combined naturalistic and spiritual causes, and so did its treatment. Many animal and vegetal substances were reputed as anti-epileptic remedies. Already in the 18th century many were condemned as useless, despite still being in use. Among the chief of them were earthworms, powdered human skull, scrapings of human vertebrae, human brain, unicorn horn, burnt ivory and the foot of an elk, substances mentioned in books and found in nearly every early modern cabinet of curiosity or apothecary. When the Jesuit order was expelled from Spain and the Americas in 1767, nails of the great beast were recorded in apothecaries' shops throughout the continent. In Africa, on the other hand, the names 'the great beast' and *alce* were used for the Congo animals that the Portuguese called *macoco* and the locals *ncocco* or *néollo*. According to the Capuchin Italian missionaries to East Africa, the nails of the right foot of these beasts had peculiar virtues. Paris in 1709 offered *pied d'élan* and *ongle d'élan*; German apothecaries from the second half of the 17th century, *Elchsklauen*. *Ungula alces*, vulgarly called 'the elk claw', was a cloven hoof, moderately large, of a shining black colour, very hard and considerably heavy. The druggist generally took care to have a part of the leg of the animal to show that it was truly the foot of the elk and not of some similar animal.

[1] M.F. de Enciso, *Suma de geographia, q[ue] trata de todas las partidas y prouincias del mundo: en especial de las indias: y trata largame[n]te del arte del marear: juntame[n]te con la espera en roma[n]ce: con el regimie[n]to del sol y del norte: nueuamente hecha* (Sevilla: Jacobo Cronberger, 1519).

[2] G.F. de Oviedo y Valdés, *General y natural historia de las Indias, islas y Tierra-Firme del Mar Océano* (Real Academia de la Historia, Madrid, 1852), vol. 3.

[3] M. Foucault, *The Order of Things: An Archaeology of the Human Sciences* (New York, NY: Pantheon, 1970).

Before becoming a source of medicinal nails, elks had been highly valued for their skins. The Russians obtained them from the Siberian Khanty and Nentsy peoples, trading in hides with China. The trade in elk skins from Russia and Livonia was in part managed by the Dutch, who transported them to Spain and Portugal, where *anta* – as mentioned before – became the general name for the elk, the buffalo and all animals 'which had an armour', namely animals whose skins, reputed for their quality, were used for crafting shields, armours, breeches and jackets for soldiers. Like the skins of rhinoceros, the African *ncocco* and the American tapir, oil-tanned elk skin was highly prized for clothing since it was considered bulletproof. Not surprisingly, Félix de Azara was still attributing this property to the Paraguayan tapir in the late 18th century, emphasising that 'the gun never succeeds in killing them'. Azara, apparently, was simply gathering the observations of previous authors, notably the 17th-century chronicle on Paraguay written by Jesuit father Antonio Ruiz (1585–1652).

According to Armas, Ruiz was the first to attribute anti-epileptic virtues to the tapir – so Azara was neither the first nor the only one. Beginning in the 17th century, every time the tapir was described in no matter which region of South America, the medical virtues of its hoof reappeared. The Jesuit Father José Gumilla (1686–1750), for instance, in 1731 reported on its medical use in the Orinoco missions. Continuing into the 19th century, on the upper Essequibo in Guyana, the hoofs of a tapir were used as charms for snakebites, ray stings and fits of all kinds. Creole residents used the *gran bestia* in Jamaica and Ecuador. Gumilla's observations would be incorporated into European remedy books and were included in the 18th-century translation into Spanish of the *Charitable Remedies of Madame Marie Mapéau Fouquet*, that 'hotchpotch of traditional pharmacy (excrement, animal oils, echoes of old astrological medicine) and the fashionable remedies from the seventeenth century (mercury, antimony)'.[4] When originally published in French in 1675, Fouquet's book said nothing about either the South American tapir or the great beast. However, the French edition from 1696 listed the so-called *poudre merveilleuse* as one of the many recipes for curing epilepsy. Translated into Spanish in 1739, the collection of recipes incorporated the great beast twice: first, in the translation of the above-quoted recipe, where the *ongle d'élan* was translated as *uña de la gran bestia*, and second in Father Gumilla's observations, where the *gran bestia* was defined as the anta of Venezuela. Similarly, in Spanish dictionaries from the late 18th century, the elk (or anta) is replaced by the tapir: anta became an animal from the Indies, whose left nail was known as *uña de la gran bestia*.

At the end of the 18th century, the French anatomist Georges Cuvier (1769–1832) decided to compose the name *megatherium* ('great beast' in Greek) for a skeleton of a 'rare animal' found in the environs of Buenos Aires and mounted as an almost complete skeleton in the Royal Cabinet of Natural History in Madrid. In so doing, Cuvier made the extinct mammal from South America the only and unequivocal 'great beast' (see 'Megatherium' in this volume). Perhaps Cuvier decided to baptise a new species with a name of such vague meaning specifically to close a long-existing debate. Did he find inspiration in the report of the Spanish officer who, at the moment of the discovery, described the fossil bones to be shipped to Spain? The draughtsman had compared the unknown animal not only with the elephant but also with the anta or *gran bestia*. Buffon had called the tapir 'the elephant of the New World'. Now, with the new principles of Cuvierian comparative anatomy, there was no doubt that the greatest beast from South America had passed away long ago. Nevertheless, the beast continues to live in the global history of science, in which Cuvier's anatomy is but one important episode in a long chain of events.

[4] M. Ramsey, 'The popularization of medicine in France, 1650–1900', R. Porter (ed.), *The Popularization of Medicine (1650–1850)* (London/New York: Routledge, 1992), 103.

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CINCHONA

Matthew James Crawford

If you have ever had a gin and tonic or just plain tonic water, then you are already familiar with what cinchona bark tastes like. The bitter flavour of tonic water is due to added quinine, an alkaloid from the bark of various species of cinchona tree native to forests of the Andes and the Amazon basin in South America. We owe the tasty combination of tonic water and quinine to the British Empire. As it turns out, quinine is a prophylactic against malaria. In the 19th century, quinine-enriched tonic water was used to safeguard the health of the soldiers and colonists who were the vanguard of the British Empire in malaria-prone regions around the globe. But well before quinine became an instrument of imperialism in the 1800s, cinchona bark was one of the world's most important medicaments and medical commodities. How did the world come to know this South American wonder drug?

The answer to this question points to the critical importance of the early modern Andean world in the global history of knowledge. We do not know exactly when the medicinal properties of cinchona bark were first discovered, but we can make some good guesses about who discovered them. According to the most recent research by historians and anthropologists, it seems likely native healers (known as *hanpiq* in Quechua, *quilliri* in Aymara and *curanderos* in Spanish) in the Andean regions of precolonial South America were the first to use the bark medicinally. Pre-Colombian artefacts, colonial texts and recent studies of Andean ethnomedicine provide ample evidence that the native cultures of the area harbour a deep and dynamic history of medical theory and practice. European colonists benefitted from this medical knowledge in the early years of Spanish colonisation in the Andes. In 1571, a description of cinchona bark and its uses among Indians in the region of Guayaquil appeared in one of the first accounts of medicinal substances from America published in Europe. Its author was Nicolás Monardes (1493–1558), a physician based in Seville, Spain's primary port city on the Atlantic and an ideal location for collecting information from merchants, missionaries and other travellers returning from the Americas. This and all other early accounts identify the peoples of the Andes as the providers of information about the bark. As a result, Peru, as the region became known in Europe, gained a reputation in the early modern world not only as the primary source of the bark but also as the source of knowledge about the bark. Indeed, in many regions of Western and Southern Europe the bark became known simply as *cortex peruvianus* or Peruvian bark.

By the end of the 17th century, cinchona bark had become one of the most important and valuable medical commodities in the Atlantic world. Its success was due in part to its reputation as a medicament. Healers throughout the region soon developed a variety of applications for the bark. At the same time, its success as a medical commodity

Figure 1. Bag for cinchona bark (1777–1785). Credit: Science Museum, London.

was also due to the fact that it travelled well. Its medical virtues remained intact even after the long journey across land and sea from Andean forests to European pharmacies.

What most existing accounts of the history of cinchona bark often overlook is how much knowledge and skill it took to produce cinchona bark of sufficient quality for medical use and sufficient stability to travel long distances. Fortunately, communities of healers in the Andes – especially those in the regions of what is today southern Ecuador and northern Peru – had been cultivating this knowledge and expertise for generations. The first step in the process was finding the trees. In the dense and verdant forests of the northern Andes, this was no easy task. And after the bark became a major medical commodity in the late 17th century, the task became more difficult and time consuming with each passing year. Since cinchona trees were not cultivated in South America, *cascarilleros* – as bark collectors were known in the Spanish language – had to travel deeper and deeper into the forests in search of cinchona trees to supply the growing demand for bark. Once a stand of trees was located, a bark collector had to be able to identify which of the trees had the best bark for harvesting, based on various factors including the age of the tree and its local environment. Then, the bark was carefully stripped, with attention so that the resulting strip be neither too thin nor too thick. The next step was to dry the pieces of bark by laying them out under covered wooden structures specially constructed for that purpose. Drying the bark was considered a particularly important step for locking in its medical virtues. Finally, the bark collectors carefully packed the strips into wooden crates or leather pouches known in Spanish as *zurrónes* for their long voyage to Europe.

The knowledge and skill of Andean cascarilleros and curanderos has gone largely unrecognised because these groups left few written sources and European observers were often dismissive of indigenous knowledge. According to studies by Peruvian anthropologist Lupe Camino, the region of what is today northern Peru and southern Ecuador, where European colonists first learned about cinchona bark, was one of intense activity among Andean healers for centuries before Spanish colonisation and indeed remains so today. Many of the earliest European accounts of the bark report that native peoples in this region taught European colonists, missionaries and soldiers about cinchona and its uses. Nicolás Monardes reported in his late 16th-century book on American medicaments that the Spanish learned to use the bark medicinally 'on the advice of the Indians'.[1] A few decades later, in 1639, Gaspar Caldera de Heredia echoed Monardes with his account of how Spanish colonists in Quito 'were taught by the Indians of that region' to use cinchona bark medicinally and how Jesuit missionaries learned about the bark by observing the ways local Indians used it.[2]

Records of trade from cities such as London and Seville show that by the late 17th century cinchona bark had become the most prominent medical drug imported to Europe from the Americas. As the reputation of cinchona spread and its prevalence in apothecary shops increased, the bark became an object of study. For example, in Genoa in the 1630s, physician Sebastian Bado conducted therapeutic tests with it, and in the late 17th century, it was one of the first items that Dutch naturalist and physician

[1] N. Monardes, *Segunda parte del libro de las cosas que se traen nuestras Indias Occidentales, que sirven al uso de medicina* (Seville: En Casa Alonso Escriuano Impressor, 1571), 117.

[2] G.C. de Heredia, *De pulvere febrifugo Occidentalis Indiae (1663) y la introducción de la quina en Europe*, J.M.L. Piñero and F. Calero, eds. (Valencia: Instituto de Estudios Documentales e Históricos sobre la Ciencia, 1992).

Figure 2. Watercolor map of the Loja region in the Audiencia of Quito depicting bark collectors and cinchona trees labelled as cascarilla *(*c. *1769). Credit: Wellcome Collection.*

Antonie van Leeuwenhoek (1632–1723) studied under his microscope. These studies would not have been possible without the skill and expertise of Andean cascarilleros and curanderos, who continued to produce medically efficacious bark for use by European physicians and pharmacists and their patients.

In the 18th century, European monarchies – notably those of France and Spain – supported several scientific expeditions to South America with further study of the cinchona tree and its bark an explicit goal. Unsurprisingly, the expeditions relied heavily on Andean knowledge of cinchona. In 1737, Charles Marie de La Condamine (1701–74) led a Franco-Hispanic expedition to the Audiencia of Quito to take measurements of the shape of the Earth at the equator. La Condamine visited Loja, the most famous cinchona bark producing region in South America, to learn more about the tree. During his visit, he depended on the expertise of Fernando de la Vega, a bark collector and curandero in Loja. Vega led La Condamine on excursions to observe cinchona trees in their natural habitat, and he collected bark samples for the Frenchman. In the late 18th century, cinchona merchants and bark collectors in Lima and other regions of the Viceroyalty of Peru provided their expert knowledge and assistance to the Royal Botanical Expedition to Peru and Chile (1777–88), led by the Spanish naturalists Hipólito Ruiz (1754–1816) and José Pavón (1754–1840). In the Viceroyalty of New Granada, José Celestino Mutis (1732–1808), director of the Royal Botanical Expedition based in Bogotá, learned from local experts such as Miguel de Santisteban, an official at the royal mint in Bogotá who had travelled to Loja, as well as Sebastian López Ruiz, a physician from Panama.

scientific travellers from Europe would have been at a loss to gather, understand and classify specimens.

Andean knowledge of cinchona bark was also vital to efforts that led to the identification of quinine, the plant alkaloid that gives cinchona bark its effectiveness in treating malaria. European efforts to identify the active principle of cinchona bark intensified in the 18th century, in part in response to the increase in trade in the bark and in part as a consequence of increasing sophistication in the chemical analysis of plants. In the 1790s, French chemist Antoine François de Fourcroy (1755–1809) conducted a systematic chemical analysis of cinchona bark, isolating a red, resinous substance that had some alkaline chemical properties. Ultimately, his efforts proved ineffective in the treatment of malaria. In 1811, Bernardino António Gomes, a surgeon in the Portuguese navy, isolated a crystalline substance that he called cinchonine. However, he did not recognise the alkaline nature of

Figure 3. Image of cinchona labelled as 'Kinquina' from Pierre Pomet, Histoire generale de drogues, *1694 (Wellcome Collection; CC BY).*

Indeed, in a transcription of a report found among the extant papers of José Celestino Mutis at the archive of the Royal Botanical Garden in Madrid, Fernando de la Vega recounts the various ways in which he manipulated the bark to produce extracts and tinctures for therapeutic use. Similarly, when Mutis was looking to confirm the botanical identity of what appeared to be a new variety of cinchona tree growing in the forests outside of Bogotá, Pedro de Valdivieso, an official from Loja and a member of a merchant family prominent in the cinchona trade, offered to perform the necessary analysis and 'experiments' to make the determination. Without the benefit of the knowledge of these local experts,

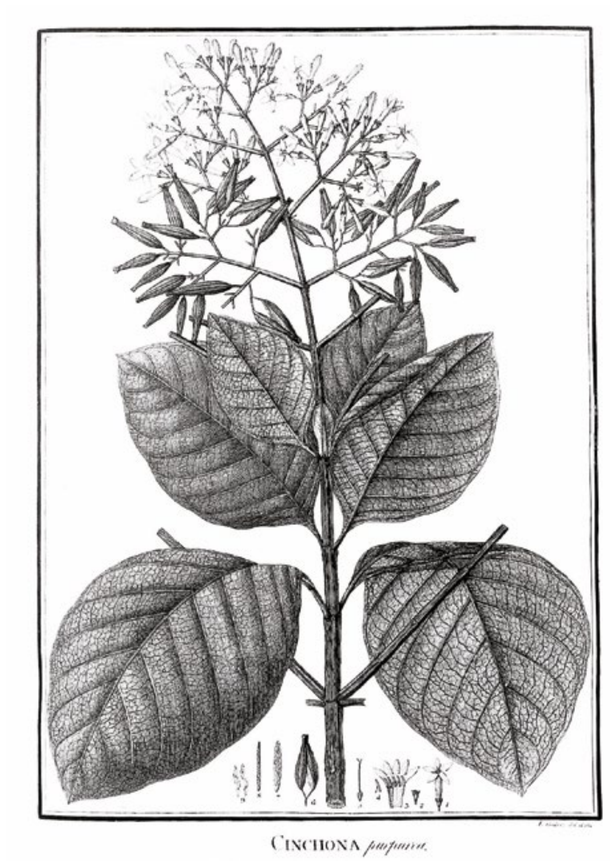

Figure 4. Image from Charles Marie de La Condamine, Sur l'abre du quinquin, *17?? (Wellcome Collection. CC BY).*

Figure 5. Specimens of cinchona peruviana *sent by José Celestino Mutis to Carolus Linnaeus the Younger, 1764 (Wellcome Collection; CC BY).*

the material. Then, in 1820, two French pharmacists, Pierre Joseph Pelletier and Joseph Bienaimé Caventou, determined that the substance isolated by Gomes was a mixture of two alkaloids, one of which they called cinchonine and the other quinine. While the success of the decades-long effort to isolate and identify quinine represented a significant technical and scientific achievement on the part of European chemists and pharmacists, it is important to recognise that most if not all of the samples of cinchona bark that they used as starting material were selected and prepared in the Andes. In other words, the technical achievement of isolating quinine in Europe was built on the prior technical achievement of knowing how to transform tree bark into an effective medicament. In this way, the knowledge of Andean cascarilleros and curanderos played a foundational role in the development of one of the most important medicaments in the modern history of medicine.

Even with the isolation and identification of quinine, cinchona bark remained an important medicament well into the 19th century. In their efforts to dampen the impact of malaria in colonial India, agents of the British Empire spearheaded a mission to transplant cinchona trees from South America to India. These endeavours were largely successful, and cinchona bark was as a result reinvented as a trademark instrument of the British Empire. In the late 1800s, the Dutch successfully transplanted cinchona trees to Indonesia. Using the chemical and botanical sciences to develop varieties of cinchona tree with high concentrations of quinine, the Dutch eventually secured a de facto monopoly on the global production of quinine.

Because tree bark is an object that can be collected directly from nature, it may not seem, at first glance, that cinchona bark is an artifact of knowledge. But as this brief account has noted, the strips of cinchona that circulated and alleviated the suffering of countless people in the early modern world were not just random pieces of tree bark. They simultaneously embodied the individual knowledge of the particular person who harvested them from Andean forests and the collective knowledge of Andean medicine and culture. The ability of the scientific agents of European empires to produce new knowledge was thus made possible by the deep and dynamic history of knowledge-making in the Andes.

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POTATO

Rebecca Earle

Figure 1. M. Frostner and R. Schweiker, Potatoes Are Immigrants, *2016 (courtesy of Keep It Complex and M. Frostner).*

In 2016, shortly after the United Kingdom voted to leave the European Union, posters started to appear in British cities announcing that 'Potatoes Are Immigrants'. A drawing of a cheerful heap of chips, together with one of those little takeaway forks, accompanied the text. Versions of the image were spotted in the United States shortly afterwards. The poster, by Mia Frostner and Rosalie Schweiker, reminds us that this most 'British' of foods is itself, originally, from somewhere very far away. As in almost every other place where it is eaten today, the Andean origins of the potato have been forgotten. The story of the potato's travels from the American Cordillera to everywhere is a tale at once of colonisation, conflict and local innovation, condensed into a small, earthy mouthful.

When he was growing up in 1970s India, the artist Subodh Gupta wondered whether everyone ate potatoes or if it was only people in Bihar. A French traveller visiting Colombia in the early 19th century was surprised to see 'European' potatoes sold alongside local vegetables such as cassava. For an Indian boy, potatoes are Indian. For a Frenchman, they are European. Today, many people in the United Kingdom and United States believe that potatoes were brought to the British Isles by Sir Walter Raleigh, who supposedly transported them from Virginia. This notion has been circulating for centuries. 'Potatoes of Virginia' is how the tuber is labelled in one of the earliest English illustrations, which appeared in the botanist John Gerard's 1597 *Herball*.[1] 'This excellent root . . . was first brought into Europe from America, by Sir Walter Raleigh', a horticultural handbook from the late 18th century reported matter-of-factly.[2] Raleigh, the adventurous Elizabethan courtier and explorer, is credited with introducing any number of American foodstuffs to Europe alongside potatoes; the US comedian Bob Newhart riffed on this theme to brilliant effect in a 1962 monologue, in which he imagines Raleigh trying to convince a sceptical West India Company official of the commercial potential of turkeys, tobacco and coffee.

In fact, potatoes originate from the spine of mountains that runs from the Andes in Bolivia and Chile northwards through the Rockies. These mountains are the homeland of all potatoes. No one outside of these lands had seen a potato before Spanish conquistadors arrived in South America in the 1530s. The encounter of the Old and New Worlds set in motion a global whirlwind that blew potatoes to India, France and beyond.

In Peru the potato had long been a staple, eaten alongside maize, quinoa and a multitude of other vegetables. Freeze-dried, it could be converted into a powder that lasts for years, and it was enjoyed fresh in soups and stews. Unlike maize, which held a high status in the Inca state, potatoes were considered a lowly food, necessary but banal. The Inca ruler himself participated every year in a symbolic maize-planting ceremony, to the accompaniment of music and song, and similar state-level festivities marked the maize harvest. In the sacred fields around the Inca capital, Cusco, small gold replica cornstalks were interspersed amongst the growing maize, to 'encourage' it. No such imperial oversight was bestowed on potatoes. Cultivated at village level, they were traded and consumed within more local orbits, their growth fostered by smaller rituals. One account from 16th-century Peru describes the festivities that marked the inauguration of the planting season in the mountain village of Lampa. Local dignitaries seated themselves on carpets to watch the proceedings. A procession of richly attired attendants accompanied the seed potatoes, which were carried by six men making music on drums. Events culminated with the sacrifice of a particularly beautiful llama, whose blood was immediately sprinkled on the potatoes. Comparable practices (not necessarily involving llama blood) persist to the present day. Spanish priests objected strongly to these ceremonies but were often powerless to prevent them.

All potatoes nonetheless benefitted from the attention of the Potato Mother, Axomamma, daughter of the Andean earth goddess Pachamama. Together with her sisters and their all-powerful mother, Axomamma controlled the earth's fertility, overseeing the growth of potatoes and other things necessary for sustenance. The veneration of this divine feminine dynasty long predated the official rituals of the Inca empire and reflected the centrality of potatoes to the diet of ordinary people in the Andes. Household shrines to Pachamama and her fertile daughters balanced state-level neglect of the tuber.

Imperial ambitions and desire for wealth brought Francisco Pizarro and his soldiers to Peru in the 16th century. These same forces propelled the potato around the world. The ships carrying crown agents and merchants also transported potatoes to new destinations, which were themselves often undergoing drastic modification as a result of imperial expansion and overseas trade. In New Zealand, where European sailors had planted potatoes in the 1770s, the tubers were quickly adopted into Māori agriculture both as a foodstuff and as a commodity. As a food they supplemented the local staple of sweet potatoes. Unlike sweet potatoes, which were embedded in a pre-existing web of ritual restrictions governing cultivation, the newly arrived potatoes were free of such prohibitions. They proved a popular addition to village agriculture and quickly became an important foodstuff, consumed in huge quantities at the *hui* or festive gatherings that punctuated Māori life. Figure 2 shows a Māori man named Watikini eating a potato. The Scottish naval officer who sketched his portrait noted that he cleaned the plate. Potatoes also acquired an economic importance within Māori society. Together with pigs, they were used as a currency when trading with Europeans for muskets and other iron goods. By the early 19th century, Māori farmers were growing the plant on a commercial

[1] J. Gerard, *Herball, or General History of Plantes* (London, 1597).
[2] J. Adam, 'Of the culture of esculent roots: of potatoes', *Practical Essays on Agriculture* (London, 1789), vol. 2, 1.

Figure 2. J.C. Crawford, Watikini Eating Potato, *pencil and ink drawing, 1861 (courtesy of Alexander Turnbull Library, National Library of New Zealand, E-041-046).*

scale specifically for this purpose. European voyages of exploration and colonisation brought the potato to New Zealand, but its entry into Māori life was the result of Māori initiative.

Today, potatoes are grown in virtually every country and are the fourth most important food crop globally. The skilled task of adapting the potato to the varied growing conditions it encountered in New Zealand, northern China, Lancashire and elsewhere was undertaken largely by the anonymous small farmers who raised the new arrival in garden plots and doubtless appreciated its prolific yield and nutritious content. While a hectare of land sown with wheat may yield enough protein to feed seven people over the course of a year, a hectare of potatoes will nourish 17. Only soybeans produce more protein per hectare, among the major crops. Potatoes also require less water than other staples and grow in a great variety of climatic and soil conditions. Although smallholders and peasants seem to have recognised the potato's attractions quite quickly, it took some time for scientists and government agencies to embrace it. In 17th-century Ireland, colonial representatives of the English state complained that locals spent too much time growing potatoes, smoking tobacco and lazing about. Contemplating regional diets from 1740s Sweden, the great botanist Carolus Linnaeus wondered why on earth servants 'find it so necessary to go on eating potatoes'.[3] International organisations concerned with world hunger have now caught up

[3] C. Linnaeus, *Skånska resa år 1749* (Stockholm, 1751), 7 June 1749; L. Koerner, *Linnaeus: Nature and Nation* (Cambridge: Harvard University Press, 1999), 148–9.

with Swedish servants and Irish peasants; 2008 was declared the United Nations' International Year of the Potato, in recognition of its contribution to the fight against food insecurity.

We can thank Andean farmers for the global potato. Andean farmers domesticated wild potatoes some ten thousand years ago, and they continue to husband the potato's genetic diversity today. Since the 19th century the number of varieties used in commercial cultivation has shrunk tremendously, and many people worry that this concentration on a small number of cultivars magnifies the risk posed by pathogens such as *Phytophthera infestans*, or late blight, the microorganism that devastated potato fields, and Ireland, in the 1840s. The best way to ensure against a repeat of Black '45 and the terrible Irish Famine is to diversify. Doing this requires the know-how and expertise of Andean farmers. Most Andean potato farmers maintain between 12 and 15 different plots in continuous cultivation. They swap both seeds and fields with neighbours. Through such exchanges a single farmer can gain access to a hundred different potato cultivars. Matching particular seed potatoes to the soil and environmental requirements of specific pieces of land requires a vast body of practical agronomic knowledge, and this sort of constant evaluation and innovation is responsible for the remarkable number of potato varieties in the Andes today: current estimates put the figure somewhere between 2,700 and 3,800. Perhaps we will all be eating more from the Andean potato cornucopia in the future.

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GUANO

Gregory T. Cushman

Hidden away among the endless strata of mineral specimens at the Museum of Natural History in Berlin is a corked glass jar of caked tan powder with scattered flecks of grey (Figure 1). Its main label identifies it simply as 'Guano, excrement of birds, that was found in great abundance along the coast of Peru'. The specimen has long since lost its once-pungent scent of wet dog and has been kept in the museum's teaching collection for decades. How did a sample of Peruvian bird dung find its way into one of Europe's most prestigious mineralogical collections? The answer is not hard to fathom: Guano played a critical role in the economic and geopolitical transformation of the modern world, from Lima to London and Berlin.

From the 1840s into the 1950s, a handful of capitalists and states made vast fortunes from this malodorous commodity, exploiting a labour trade that recruited tens of thousands of Chinese, Pacific Islander, Andean and Afro-Peruvian labourers to perform the dirty work of excavating entire mountains of dried excrement. During the 'guano boom' of 1840–80, revenues from the trade provided a fabulous but volatile source of income for the Republic of Peru. Meanwhile, the transnational race to acquire guano islands and two closely related commodities, nitrates and phosphates, inspired vast empire-building campaigns. These devolved into three major wars: the Chincha Islands War (1864–6), the War of the Pacific (1879–84) and, in guano's last phase, the Second World War.

Guano's farthest reaching impact on modern history has been ecological. During the four decades of its initial boom, guano exports from the coast of Peru, and smaller quantities mined from southern Africa, the equatorial Pacific and other bird islands, increased by a factor of ten the amount of concentrated nitrogen, phosphate and potassium available on the world market for farming and industry (Figure 2). Guano was the Miracle-Gro of the mid 19th century. It was expensive, but it enabled profit-minded northern farmers to save the cost of fallowing their land or paying workers to shovel farmyard manure by the wagonload. By a similar logic, farmers preferentially applied it to fodder crops with the goal of maximising high-value animal and meat production. During the 20th century, guano was redirected to sugar and cotton plantations in Peru and to wheat fields in South Africa whose crops were intended for export. Rather than providing bread to the hungry masses of the industrial age, guano enabled the prosperous to eat ever higher on the food chain.

Guano by itself did not establish the 'metabolic rift' favouring the productivity and prosperity of the industrialised global North over the colonised global South. Indeed, Peruvians' re-appropriation of guano for their own use during the 20th century – based on the careful conservation of living colonies of marine birds – calls into question such grand North–South dichotomies and narratives. Nevertheless, guano was fundamental to the popularisation of new, input-intensive agricultural practices worldwide that

Figure 1. Guano specimen with handwriting examples demonstrating that this sample once belonged to Alexander von Humboldt and likely originated from his time in Peru in 1802 (courtesy of Mineralogisches Sammlung, Museum für Naturkunde der Humboldt-Universität zu Berlin, 1996/5850, S3510-LS004/12 (left and top right); Tagebücher der Amerikanischen Reise VIIbb et VIIc (Quito-Lima), Staatsbibliothek zu Berlin, Digitalisierte Sammlungen, acc.860/2013, available at https://digital-beta.staatsbibliothek-berlin.de/, [725–26] 366r-v, [637] 308v, [737] 374r (middle and lower right)).

have made farms ever more reliant on ecological productivity from distant environments. This, in turn, encouraged the development of new extractive industries aimed at multiplying the world's nitrogen, phosphate and potassium supplies. In the process, this massive mobilisation of nutrients by industrial agriculture not only enabled the multiplication of members of our own species but also fundamentally altered the chemistry and ecology of soils, aquatic ecosystems and the atmosphere all over the world. Guano, therefore, deserves a prominent place in any museum or cabinet of curiosities of the Anthropocene, our current 'human epoch' of planetary history.

Humboldt did not discover guano or its uses. Its history runs deep in Peru. Guano-producing birds and guano-rich islands appear prominently in ancient ceramics of the Moche culture of coastal Peru, and the chemical signature of guano has been identified in pottery from the Nazca valley that is more than two thousand years old. Hundreds of artefacts have been found buried deep within Peru's guano deposits, including an early colonial coat of arms belonging to Don Pedro Guañeque, a native lord. Guano received prominent attention in the best-known early modern scholarly writings on Peru. For the Jesuit naturalist José de Acosta, long resident in Peru, guano was an

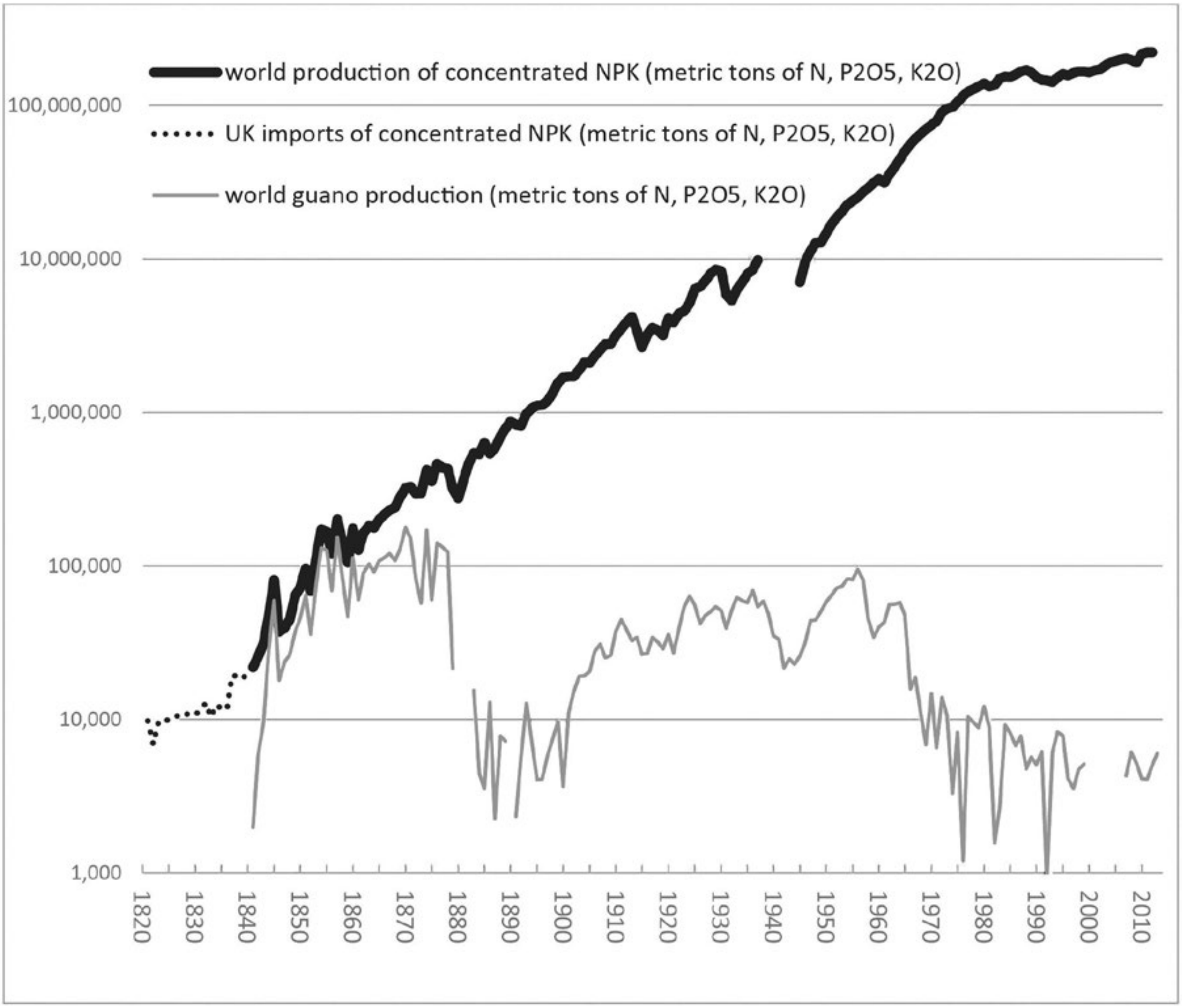

Figure 2. World production of concentrated nitrogen, phosphate, potassium and guano, 1820–2013 (logarithmic projection).

icon of natural theology. 'For in addition to being ugly in themselves', he wrote, the seabirds that produce guano 'are good for nothing except to void excrement; yet even so, they may be no less useful.' The erudite padre continued, 'I have thought about this and been astonished by the providence of the Creator, who has decreed in so many ways that the other creatures must serve man . . . So not only the flesh of birds to eat, and their songs to delight us, but their very excrement serves to improve the earth.'[1] For the Peruvian mestizo historian Inca Garcilaso de la Vega, guano was a paragon of the good government of the Inca kings from whom he was directly descended. 'In the time of the Inca kings', he wrote,

> these birds were so carefully watched that no one was permitted to land on the islands during the breeding season under pain of death, so that they should not be disturbed or driven from their nests. It was also illegal to kill them at any season either on the islands or elsewhere, under pain of the same penalty. Each island was assigned, on the Inca's instructions, to a certain province, or if it was a large island, to two or three provinces . . . Each

1 J. Acosta, *Natural and Moral History of the Indies,* ed. Jane E. Mangan, trans. Frances López-Morillas (1589; Durham, NC: Duke University Press, 2002), 238–39.

village had its piece and each householder in the village his part, according to the quantity of manure he was reckoned to need . . . and the taking of any in excess of it was punished as an infringement of the law. Nowadays the manure is used quite differently.[2]

For the enlightened Spanish explorers Jorge Juan and Antonio de Ulloa, guano was a wondrous curiosity of natural history and an exemplar of the natural abundance of the Viceroyalty of Peru. Ulloa made a special trip out to 'these islands when several bark-lined vessels came to load with it; at which time the insupportable smell left me no room to doubt of the nature of their cargo'.[3] All these commentators agreed that this natural fertiliser was extraordinarily effective, existed in prodigious quantities, supported a vibrant coastal trade and was derived in one way or another from the vast, insular colonies of marine birds that dotted the arid Peruvian coast.

Guano's transmutation from a well-known Peruvian resource into an international scientific obsession occurred largely thanks to the intervention of the ambitious Prussian naturalist Alexander von Humboldt (1769–1859). But farmers of the global North did not automatically adopt Peruvian guano as a fertiliser after its collection and certification by European chemical science. This required the advocacy of scientists and entrepreneurs from Peru, most notably the Arequipa-born savant Mariano Eduardo de Rivero y Ustáriz (1798–1857), as well as field experiments carried out by a far-flung international network of local agricultural societies.

Although the episode is routinely omitted from histories of Humboldt's explorations, he had very important business to attend to on the coast of Peru. He timed his arrival to Lima to correspond with the passage of Mercury across the face of the sun on 9 November 1802. After stationing his instruments atop the tower of the great fortress of Callao, Peru's most important port, Humboldt calculated the record altitude that he and his companions claimed to have reached during their failed ascent of Mount Chimborazo. He also investigated the ancient native use of balsa wood in coastal shipping, and passed the time sketching a fur seal and penguin (Figure 3). But one phenomenon impressed itself on Humboldt's senses more powerfully than any other during his time on the Pacific Coast. While prowling the docks of Callao, he could not help but notice several barges filled with a substance known among locals by the Quechua word *wanu*. It smelled so powerfully of

Figure 3. Sketch of a paxaro niño *or Humboldt penguin* (Spheniscus humboldti), *A. von Humboldt (Callao, 1802). This guano-producing bird species is endemic to the Pacific Coast of Peru and Chile. It was renamed by Eurocentric scientists in Humboldt's honour in 1834. Their numbers decreased radically with the removal of most guano deposits from the Peruvian coast, which they used for digging nest burrows (Pinguin (1802), courtesy of Staatsbibliothek zu Berlin, Digitalisierte Sammlungen, I/2105, 3).*

2 I. Garcilaso de la Vega, *Royal Commentaries of the Incas and General History of Peru,* H.V. Livermore, trans. (Austin: University of Texas Press, 1966), vol. 1, 246–7.

3 J. Juan and A. Ulloa, *A Voyage to South America,* (London: L. Davis and C. Reymers, 1758), vol. 2, 100–1, 106–7.

ammonia that Humboldt erupted in fits of sneezing when he got too close. He had first seen large piles of this manure north of Lima ready to be laid on coastal agricultural fields. Locals assured him that barges travelled frequently to the Chincha Islands to the south to mine deposits estimated to be at least 15 metres thick. He doubted local opinion that the cormorants and flamingos he had seen on his way down the coast could produce such massive quantities. But it began to dawn on him that guano might have been the vital ingredient that had allowed Peru's native population to reach into the millions before the arrival of the Spanish, and that had enabled the Chimú civilisation to build the massive network of aqueducts and earthworks that he had visited near Trujillo along the northern Peruvian coast.

Humboldt returned to France in August 1804 after five years in the New World. It took him another three decades under the courtly patronage of the Prussian king and 30 volumes, most in French, to write up the results for a primarily European readership. But Humboldt wasted no time in arranging for Europe's foremost chemists to analyse the samples of guano he had brought back with him from Callao. He did so not only because he recognised the uniqueness of guano but because sharing such specimens was a critical means of cultivating his network of relationships with other scientists – that is, of cementing his reputation as an important source and agent of scientific discoveries. On 26 November 1804, Antoine François de Fourcroy and Louis Nicolas Vauquelin presented a detailed quantitative analysis of guano before the pre-eminent academic institution of Napoleonic France, the Institut National des Sciences, Lettres et Arts. Their analysis was accompanied by a report by Humboldt crediting Peru's native peoples with guano's discovery. He also speculated that Peru's guano reserves had formed slowly over aeons of geological time, like the coal deposits of Britain. Martin Heinrich Klaproth, Prussia's leading analytical chemist and a former mentor to Humboldt, also analysed a sample and published his results in his widely read mineralogy handbook. In a series of four experiments, Klaproth determined that his sample was 16 per cent uric acid (a substance rich in nitrogen that is prevalent in bird and reptile faeces and kidney stones), 10 per cent phosphate of lime, and 28 per cent quartz sand, among other substances. Klaproth also published an extended report from Humboldt, the manuscript original of which can be found among the pages of Humboldt's Peruvian diary. The mineral collections of Klaproth and Humboldt formed the initial core of what became the mineralogical cabinet of the Berlin Museum of Natural History after it was established in 1810. In consideration of this fact, the orthography of the underscored word 'Huano' on the museum's specimen label, its clear similarity with the handwriting in Humboldt's original guano treatise and the way he consistently formed the letter 'H' in his signature, we can confidently conclude that the pictured museum sample once belonged to Humboldt and likely originated in Peru in 1802. These and subsequent chemical analyses showed Peruvian guano to have an exceptionally high percentage of nitrogen and phosphate for a naturally occurring substance, along with significant quantities of potassium, making it a powerful fertiliser.

English chemist Humphry Davy also gained access to a sample of guano in 1805. Davy had achieved international fame for his experiments with nitrous oxide and other chemicals. He was so impressed by Peruvian guano that it helped him decide to give up on his dream of running away to the Lake District to take up the life of a Romantic poet with his close friends Samuel Taylor Coleridge and William Wordsworth, both of whom died young because of their propensity to seek inspiration from consuming laughing gas and other mind-bending chemicals. Instead, Davy rededicated his chemical talents towards the practical study of agricultural manures, 'for the purpose of awakening [man's] industry, and of calling forth his powers'. Davy did more than any other figure to popularise experimentation with nitrogenous manures among science-minded farmers in the early 19th century. Another English experimenter, Alexander Beatson performed the first highly publicised field experiments with guano outside Peru, using locally collected guano on the tropical island of St Helena. Beatson had just been appointed governor and wanted to prove that this degraded South Atlantic island could be converted into a valuable plantation colony with the help of modern science.

A transhemispheric war prevented anyone from capitalising on these discoveries for many years. Peru had witnessed massive native insurrections just prior to Humboldt's brief visit and soon became embroiled in a series of revolutionary wars that spanned the Atlantic, from Napoleon's invasion of Iberia and the crowning of his brother Joseph Bonaparte in 1808 as king of Spain to the final surrender of the Spanish fortress at Callao to independence forces led by Simón Bolívar in January 1826. A young Peruvian disciple of Humboldt and political ally of Bolívar, Mariano de Rivero (Figure 4), played a crucial role in reviving international interest in guano. His father had attended the famous Cortes of Cadiz as a representative of southern Peru. Rivero's father had denounced unsustainable harvesting of Peruvian guano at the Cortes in 1812, making a controversial request to have the Arequipa region released from the centralised control of Lima, the capital of the Viceroyalty of Peru. His son became a close confidant of Humboldt during the late 1810s while studying to become a mining engineer in Paris, far from his war-torn homeland. Humboldt arranged for Rivero to make a tour of the Freiberg Mining Academy and silver mines in Saxony, where Humboldt had received his main scientific training, in part from Klaproth. Rivero is often credited with bringing the vast nitrate deposits of the Atacama Desert to the attention of European scientists at this time, by making a sample available for crystallographic analysis by the French mineralogist René-Just Haüy.

In 1822, on Humboldt's recommendation, Rivero was selected to staff an expedition to South America to rebuild the scientific institutions of the new federation of Gran Colombia after the devastation of the independence wars, where he served as founding director of the National Museum and School of Mines in Bogotá. After the surrender of Callao, Bolívar convinced the patriarch of Peru's enlightened scientific community, José Hipólito Unanue, to stay on as the top civilian official of the Republic of Peru, and Unanue and his colleagues appointed Rivero to serve as director general of mines and public education. In this post, Rivero founded independent Peru's first national museum, its first scientific journal and a mining academy in the highland city of Huánuco and published the first of several studies on Peruvian antiquities. Rivero also used his influential position to study and promote Peru's guano industry in ways Humboldt could scarcely imagine. In 1826, Rivero made a survey of several guano islands and performed a chemical analysis that definitively proved that old guano deposits were little different from fresh guano. He also collected data on the extent of the coastal guano trade and the material's uses by Peruvian farmers. In turn, Humboldt dutifully arranged to have one of Rivero's articles on guano published abroad in German, French and English. Others sent a series of small consignments of Peruvian guano and nitrates to experimental farmers in England and the United States for practical tests. Then in 1840–41, an old business ally of Rivero, Francisco Quirós, orchestrated a deal to export the first large shipment of Peruvian guano to Liverpool.

Figure 4. Mariano Eduardo de Rivero y Ustáriz (1798–1857), shown grasping a Moche ceramic from his collection of Peruvian antiquities (public domain). Rivero was the founding director of the National Museums of Colombia and Peru and the first scientist to engage in systematic investigations of Peruvian guano.

To be sure, the Peruvian guano boom might never have happened if not for the growing world network of local agricultural societies. Many had taken to heart Davy's dictum to treat the soil as a laboratory. Guano sales agents provided experimental consignments to these societies, who in turn published enthusiastic testimonials in the agricultural press as far afield as Canada, the West Indies and Mauritius. Another scientific disciple of Humboldt, Justus von Liebig, is often credited with sparking the 'great guano rush', not unlike the way Fritz Haber and Carl Bosch are almost singularly credited with inventing today's industrial process for synthesising nitrogen chemicals. Liebig's famous textbook *Organic Chemistry in Its Application to Agriculture and Physiology* (1st ed., 1840) enthusiastically advocated the use of mineral fertilisers by farmers but actually downplayed the value of nitrogen-rich fertilisers like Peruvian guano.

In the history of knowledge as it is broadly understood and taught in the West today, heroic northern figures like Humboldt, Liebig, Haber and Bosch have received the lion's share of credit for many key scientific discoveries. But the Peruvian mineralogist Mariano de Rivero was even more critical than his Prussian mentor in finally delivering Peru's native understanding of the use of bird excrement as fertiliser to the modern world. Also vital were experimental farmers – what we would now call citizen scientists – working in places as remote as the island of St Helena. After all, they were the ones who confirmed guano's efficacy for a host of crops and environmental conditions, and who then followed up these discoveries with much larger purchases. Ultimately, however, it was the knowledge and labours of the native peoples of Peru that made the gift of guano available to the industrialising world.

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DARWIN'S TORTOISE

Elizabeth Hennessy

On a sunny day in October 1835, a 26-year-old Charles Darwin hiked from the parched coast of Santiago Island in the Galápagos archipelago to the island's green, damp highlands. After a long walk, he sat in the shade and watched the island's giant tortoises as they ambled along broad roads that had been trodden by their elephant-like feet over countless generations. He timed their gait (faster than he had supposed), measured their carapaces (six and eight feet in circumference) and tried to lift them (tortoises can weigh upwards of five hundred pounds). Finding he could not, he climbed aboard, rapping on their shells and trying not to slip off their backs as they trudged along.

Today, the species of tortoise that inhabits Santiago Island is named for Darwin, following the system of Latin binomials used to classify species since the 18th century. *C. darwini* is one of 15 different species of Galápagos giant tortoises, each of which inhabits an island or volcano in this Pacific archipelago 600 miles off the coast of Ecuador. Galápagos giant tortoises are, along with the archipelago's famous finches, exemplary evidence of evolution. The giants diversified because of geographical separation, each species adapting to the conditions of life on a different island in the archipelago. Today, these enormous reptiles are textbook examples of the process of adaptive radiation in what is often called 'Darwin's natural laboratory of evolution'.

Yet it was not Darwin who named the species, nor he who revealed the tortoises' evolutionary significance. When Darwin was in the Galápagos, he was not yet thinking about evolution as we now understand it. Although he made notes about the tortoises' behaviour, gait, hearing and size, he did not make collections of the animals, as he did with island birds, plants, rocks, lizards and insects. Instead, he ate them.

Today we think of the Galápagos as a wonderland for both nature tourists and biologists, but in the mid 19th century most visitors came not to marvel at unique endemic creatures but to find their dinners. The tortoises were world-renowned for their taste, not their scientific import. Throughout the 18th and 19th centuries, the Galápagos were a popular stopover for ships in the eastern Pacific that carried pirates, buccaneers, and later whalers and sealers. Though the islands offered little fresh water, they were a useful storehouse where sailors could gather timber, fresh fruits and vegetables and, above all,

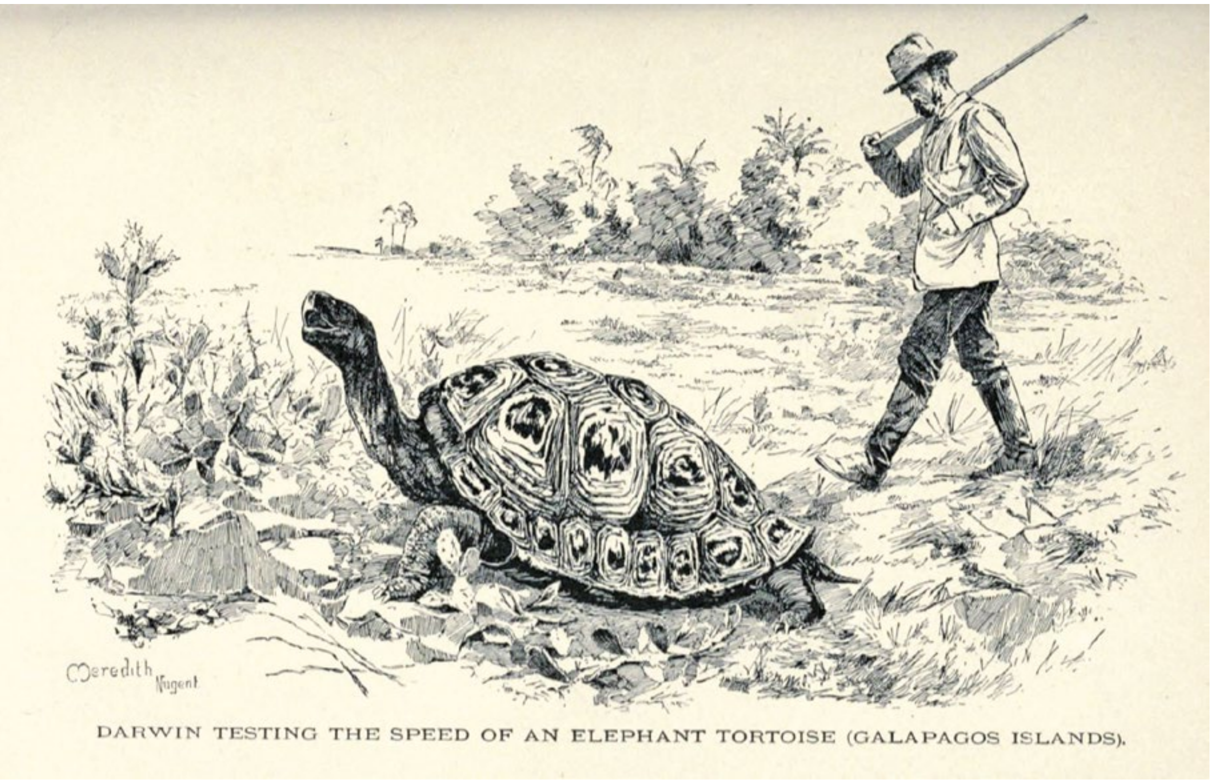

Figure 1. An imagined sketch of Darwin on Santiago with an adult tortoise. Artwork by M. Nugent, in C.F. Holder's Charles Darwin: His Life and Work *(1891).*

giant tortoises. After months at sea, weary sailors considered the tortoises a sought-after prize. As one British admiralty captain-turned-whaler wrote in 1798, giant tortoise meat 'in whatever way it was dressed, was considered by all of us as the most delicious food we had ever tasted'. The *Beagle* men took 45 giant tortoises on board as food, although ships commonly took dozens, if not hundreds, of the animals to fill their hulls. The tortoises are said to have been able to survive for months, even a year or more, without food or water, making them an ideal portable source of fresh meat and fat.

Darwin was less impressed with the animals' taste than other sailors were. For two days he camped in the highlands of Santiago with tortoise hunters, subsisting on nothing but tortoises. For dinner, the hunters made tortoise *carne con cuero* in the style of Argentinian *gauchos* – roasting meat on the breastplate and frying it in tortoise fat. Jotting down his impression of the meal afterward, Darwin deemed it 'very good', although he preferred the 'capital soup' made of young tortoises.

The tortoise hunters Darwin hired to be his guides on Santiago were not sailors but instead some of the archipelago's first human inhabitants. They were political exiles from the new state of Ecuador sent to the Galápagos as penal labourers. Throughout the 19th and early 20th centuries, the Galápagos archipelago was not only a field site for scientific endeavour and a stopover for Pacific sailors but also a developing frontier for a new postcolonial state. The islands were a place for Ecuadorian politicians to rid the new nation of undesirables – from political opponents to criminals, debtors, the poor and often indigenous people as well. The Floreana colony was called *Asilo de la Paz*, Asylum of Peace, but peace was far from its fate. Not long after the *Beagle* voyage, captive labourers rebelled, and the colony failed. It was the first in a series of ill-fated attempts at island colonisation during the period.

Darwin and *Beagle* captain Robert FitzRoy visited Floreana several weeks before going to Santiago. The men saw not simmering unrest but a flourishing hacienda of sugarcane, bananas, corn and sweet potatoes where about three hundred colonists lived what Darwin described as a 'sort of Robinson Crusoe life'. They toured the colony with the acting vice governor, a Norwegian mercenary named Nicholas Lawson. It was Lawson who sent the tortoise hunters to Santiago to supplement the rapidly diminishing population of tortoises on Floreana, which the colonists relied upon for food. It was also Lawson who first told Darwin something that, in retrospect, was a significant clue to the puzzle of evolution that Darwin was beginning to piece together.

As Darwin and Lawson toured the Floreana colony, Lawson remarked that he could 'with certainty tell from which island any [tortoise] was brought'. Weeks later, the tortoise hunters told Darwin the same thing – that the tortoises differed on each island enough that it was possible to tell them apart. On small, dry islands, the tortoises were smaller, and their shells curved up at the back of their necks, making their carapaces look like saddles (an adaptation to island environments with sparse ground cover that allowed the animals to stretch their necks up to reach leafy trees and juicy cactus pads). On larger, higher islands like Floreana and Santiago, where volcanic calderas are often enshrouded in misty clouds, the tortoises were much larger when full grown and their carapaces were dome-shaped, without the upside-down 'U' at the back of their necks. These animals lived in places where the ground was blanketed in greenery year round, giving them a steady food supply. In addition to these two dominant morphotypes, the tortoises also differed slightly in colouring – some were deeper black, others had yellow markings under their chins and throats. Lawson and the tortoise hunters would not have understood differences among the tortoise populations as evolutionary adaptations, but small distinctions in size and morphology were just the kind of significant details that hinted at the diversification of species. Yet while Darwin was in the Galápagos, he failed to see the importance of what Lawson and the Ecuadorians told him. 'I did not for some time pay sufficient attention to this statement', Darwin lamented back in England years later. 'I never dreamed that islands, about fifty or sixty miles apart, and most of them in sight of each other, formed of precisely the same rocks, placed under a quite similar climate, rising to a nearly equal height, would have been differently tenanted.'

It was thus not until Darwin was back in England that he began considering the evolutionary significance of the giant tortoises and other Galápagos animals. Upon his return, Darwin distributed the many biological specimens he had collected from the Galápagos and other places to expert taxonomists. Ornithologist John Gould, curator of the Zoological Society of London, examined the birds Darwin had collected in the Galápagos and found that what Darwin had thought were three different types of birds were in fact all ground finches with such curiously divergent forms that they represented 12 new species. But when Darwin had labelled these birds, he had not included their islands of origin. So, despite this exciting revelation, the specimens did not make for reliable evidence of evolution. Darwin got better news two months later when Gould told him that the mockingbirds he had collected, and labelled by island, were not just varieties but also differed enough to constitute separate species – related to, but distinct from, South American mockingbirds. Darwin realised the import of this information and filled the sheet of paper he had brought to the meeting with excited scribbles. Back at home, he soon started his first notebook on 'transmutation', as evolution was often called at the time.

Darwin realised the news about the finches and mockingbirds was parallel to Lawson's observation about the tortoises. But he had not made scientific collections of the tortoises – perhaps because at the time naturalists thought the Galápagos tortoises were part of the same species of giants that sailors had long reported finding on islands in the Indian Ocean, which British taxonomist John Gray had named *Testudo indica*. The remains of the 45 animals the *Beagle* crew had taken as food had been tossed overboard, or their shells turned into serving bowls and plates. The only tortoises that had made it back to England were four tiny young animals that Darwin, FitzRoy and others had brought home as pets. Yet Darwin was eager to know whether the Galápagos tortoises were distinct species, and so he gathered the four young animals for Gray to analyse. As it turned out, though, they were too small to show significant differentiation, Gray found. Darwin did not have the evidence to confirm his hunch that the Galápagos tortoise, as he wrote in his *Journal of Researches* (1845), was an 'aboriginal inhabitant' of the islands, much less that the tortoises differed by island as the mockingbirds did. It would be nearly 80 years after his Galápagos visit before naturalists proved this hypothesis.

How then did the Galápagos tortoises become evidence of evolution? The answer lies in the story of how *C. darwini* got its name.

Darwin marvelled about the Galápagos in his popular travel narrative about the *Beagle* voyage, even writing that the archipelago was the 'origin . . . of all my views'. But he scarcely mentioned the islands in his *Origin of Species*, because he did not have enough evidence. It was not until the decades after Darwin published the *Origin* in 1859 that the Galápagos became a proving ground for theories of evolution. Giant tortoises became proxies for evolution in the final decades of the 19th century after a naturalist named Albert Günther, who was the keeper of zoology at the British Museum, published a study in 1875 that showed that the Galápagos giants were not part of the *T. indica* species but were a distinct lineage. Günther thought the Galápagos Islands had five different tortoise species. As original and unique inhabitants, the Galápagos tortoises, Günther demonstrated, were what biologists now call endemic species – not only native to the islands but existing only in one particular place. They were not recent arrivals but had lived in the islands for quite some time. Yet Günther did not comment on the evolutionary significance of the Galápagos tortoises. He was ambivalent about Darwin's theory of evolution – perhaps because he worked for Darwin's arch-rival, Richard Owen, who used his position as curator of the British Natural History Museum to vociferously challenge Darwin's interpretation of what caused evolutionary change.

Figure 2. Charles Darwin in 1840, by G. Richmond.

Günther's study set off a mania for collecting giant tortoises at the turn of the 20th century, including three expeditions financed by amateur natural historian (and banking family scion) Walter Rothschild, who once housed dozens of giant tortoises on his family's Tring estate. The most extensive Galápagos expedition of this period, though, was led by the California Academy of Sciences (Cal Academy) in 1905–6. A team of eight natural history collectors set off from San Francisco with the mission of 'collecting evolution' – when they returned after spending 366 days in the archipelago, their specimens would provide the basis, as Matthew James has written, for 'vindicating' Darwin.[1] Nine months into their stay, in late July 1906, the team caught five tortoises on Santiago, including the animal that would become Specimen 8109. During a previous visit to the island in January, lead collector Rollo Beck had found the remains of the camp once used by tortoise hunters but no live tortoises there, only scattered bones. On this trip, he was determined to find living tortoises and hiked further inland through the harsh, lava-strewn terrain. Deep in the interior of the island, Beck and another collector, Ernest King, found two large male tortoises. Crew members prepared the animal specimens in situ, skinning them by dissecting them

1 M.J. James, *Collecting Evolution: The Galápagos Expedition that Vindicated Darwin* (New York, NY: Oxford University Press, 2017).

Figure 3. Walter Rothschild rides a T. darwini *tortoise, Tring, date unknown (courtesy of the Trustees of the Natural History Museum, London).*

and cleaning out their internal organs, scraping meat and fat from their skin and bones. As they skinned, Beck continued searching, eventually finding three more tortoises. The men hauled these five animals back to shore by 'backing down' smaller ones on their shoulders or strapping large ones to poles shouldered by two or more men. It was arduous work: these Santiago tortoises, one collector noted, had 'the heaviest shells and bones of any taken by us' and were 'very fat'.

Transporting specimens from far-flung locations like the Galápagos to metropolitan museums was always difficult – damp sea air, mould, bugs and bacteria ate away at organic matter, and there was always risk of simply losing collections in transport. Animals were more difficult to preserve than plants, and thus many collectors predominately saved animals with hard features – a tortoise's shell was an ideal material because of its durability, if not its size and weight. Many museums' tortoise specimens were just cleaned shells, the animal's internal organs, bones and soft tissue having rotted away or been discarded. The specimens the Cal Academy men preserved, though, were more complete – some were fully stuffed in lifelike positions, while others included the animals' necks and heads, which had been cleaned, stuffed, dried and dusted with arsenic to keep insects away.

When the Cal Academy team returned to San Francisco in November 1906, they delivered their tortoise specimens – 266 in all – to the museum's herpetologist, John Van Denburgh. It was Van Denburgh who named the Santiago tortoises for Darwin in 1907. Yet the animals Van Denburgh studied were quite different to the living creatures Darwin had watched drinking from muddy pools. The five Santiago tortoises Van Denburgh studied were dead carcasses, sitting on research tables thousands of miles away from their homeland. Of the five, Van Denburgh chose one, Specimen 8109, as the type specimen to represent the species he called *Testudo darwini*. That animal now sits in a back storeroom of the California Academy of Sciences in San Francisco. Darwin might have ridden on the backs of these tortoises, but *T. darwini* could no longer move of its own accord – its desiccated head and neck resting on a table, lifeless and only part of the animal that had once existed.

After nearly a decade of close study of the Galápagos tortoises, Van Denburgh published in 1914 the monograph that established that the archipelago had 15 different kinds of tortoise, each on its own island or volcano, as Darwin had supposed. Over the 20th century, despite debates about whether the tortoise populations should be considered species or subspecies and changes in the genus name from *Testudo* to *Geochelone* to *Chelonoidis*, Van Denburgh's monograph served as the authority on the species. The significance of the Galápagos giant tortoises as a set of species that exemplifies the dynamic evolutionary processes of life had emerged, ironically, only through the study of still life. While the Santiago species bears Darwin's name, the tale of its incorporation into the annals of evolutionary science reveals another story: one of the contingencies of knowledge production and the role of little known actors rather than the solitary genius of a scientific hero.

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DARWIN'S HUMMINGBIRD

Iris Montero Sobrevilla

One chilly afternoon ten years ago, as I paid for cream tea at Fitzbillies in Cambridge, I noticed the back of the old ten pound sterling banknote, out of circulation since 2018, for the first time. I was starting to research how knowledge about hummingbirds (*Trochilidae* family) crossed the Atlantic in the early modern period, and I was immediately drawn to the pink-and-green hummingbird portrayed next to Charles Darwin in the banknote art. In the weeks that followed, every time a tenner passed through my hands I glanced at Darwin's hummingbird for a few seconds, feeling somehow comforted to find my subject of study in such good company.

Months later, in the midst of the 2009 celebrations of Darwin's bicentennial, the hummingbird on the banknote attracted my attention again. This time it was in the news, at the centre of an unlikely controversy. During the inauguration of the exhibition *Darwin's Big Idea* at the Natural History Museum in London, Professor Steve Jones, then head of the Department of Genetics, Evolution and Environment at University College London and author of *Darwin's Island: The Galapagos in the Garden of England*, qualified the image of the ten pound banknote as 'little better than fiction'. 'There were no hummingbirds in the Galápagos' – the Ecuadorian archipelago where Darwin carried out valuable observations – affirmed Jones. 'Mockingbirds and finches were important in getting Darwin thinking about evolution, but hummingbirds played no role at all.' Furthermore, he concluded, 'hummingbirds are not even mentioned in *On the Origin of Species*', so 'why depict them?'

Professor Jones posed an excellent question. The website of the Bank of England announces briefly that the banknote illustrates the flora and fauna that Darwin 'could have found in his journey'. Lacking a more clarifying official response, let us speculate: why immortalise the most celebrated naturalist next to a New World species that 'had nothing to do with evolution'? Using the tools of the historian of science – Darwin's own writings, Victorian specimen collections and contemporary sources to place them in their historical context – I venture to suggest three possible answers.

The first possibility is that portraying a hummingbird next to Darwin – mediated by the image in the background of the HMS *Beagle*, in which the young naturalist travelled around the world from 1831 to 1836 – evokes his South American journey in general and not only his famous passage through the

Galápagos Islands. In his journal, later published as the *Beagle Diary*, Darwin, then 23, wrote impatiently from the Brazilian archipelago Fernando de Noronha on 20 February 1832: 'I am sure all the grandeur of the Tropics has not yet been seen by me. – We had no gaudy birds, No humming birds. No large flowers – I am glad that I have seen these islands, I shall enjoy the greater wonders all the more from having a guess what to look for.' A few months later, there was success. On 9 June 1832, Darwin wrote from Rio de Janeiro: 'As we passed along, we were amused by watching the humming birds. – I counted four species – the smallest at but a short distance precisely resembles in its habits & appearance a Sphinx. – The wings moved so rapidly, that they were scarcely visible, & so remaining stationary the little bird darted its beak into the wildflowers, – making an extraordinary buzzing noise at the same time, with its wings.' The following year, on his way from Santa Fe to Buenos Aires, Darwin described his hikes along the Paraná cliffs and evoked with nostalgia: 'Amongst the fallen masses of rock, vegetation was very luxuriant; there were many beautiful flowers, around which humming birds were hovering. – I could almost fancy that I was transported to that earthly paradise, Brazil.'[1] Darwin's young pen confirms that, indeed, hummingbirds were among the species that he observed in South America, but also among the ones he expected to see even before coming across them: hummingbirds epitomised tropical nature to him.

A second possibility is that hummingbirds tell us more about evolution than can be apparently discerned from *On the Origin of Species*.[2] Let us take, for example, Darwin's observation about the similitude between hummingbirds and sphinx moths (*Macroglossum stellatarum*). Nowadays, this close resemblance is recognised as one of the clearest examples of convergent evolution, the process through which unrelated creatures, like bird and insect, which have the same function in nature – as pollinators, for instance – develop similar traits and end up having a similar appearance. Hummingbirds also illustrate another kind of adaptation, reciprocal evolution. This can be observed in the direct relation between the shapes of the beaks of certain hummingbirds and the corollas of the flowers from which they feed and therefore pollinate. As Darwin explained in his *The Effects of Cross and Self Fertilisation in the Vegetable Kingdom*: 'It appears, indeed, that the beaks of humming-birds are specially adapted to the various kinds of flowers which they visit.'[3] In the ten pound banknote, the close-up to the stamen of the yellow flowers with Darwin's magnifying glass seems to remind us of these two examples of evolutionary theory. But Darwin paid the most attention to hummingbirds in *The Descent of Man, and Selection in Relation to Sex*.[4] Here he tackled the question of beauty and its place in evolutionary theory. 'It is very remarkable in how many different ways these birds are ornamented. Almost every part of the plumage has been taken advantage of and modified'. He explained these variations in hummingbirds' plumage as determinant devices in the process of sexual selection, or as he put it, 'the selection by the females of the more beautiful males'. Hummingbirds are present in Darwin's writings throughout his career, including his most famous work. In *On the Origin of Species*, Darwin presented alpine hummingbirds and their relation to those found in nearby lowlands as examples of modification to adapt to new environments, much like the variations between the famous finches of the different Galápagos Islands.

Finally, a third possibility: perhaps choosing the hummingbird as an icon of the South American fauna explored by Darwin has more to do with the English taste for this creature than with Darwin himself. Indeed, the hummingbird is an animal with a long history in the English cabinets of *naturalia*. The Natural History Museum keeps, for example, a hummingbird nest collected by Captain James Cook in Rio de Janeiro in 1768 during his first voyage of

1 C. Darwin, *Narrative of the surveying voyages of His Majesty's Ships Adventure and Beagle between the years 1826 and 1836, describing their examination of the southern shores of South America, and the Beagle's circumnavigation of the globe. Journal and remarks, 1832–1836* (London: Henry Colburn, 1839).

2 C. Darwin, *On the Origin of Species* (London: John Murray, 1859).

3 C. Darwin, *The Effects of Cross and Self Fertilisation in the Vegetable Kingdom* (London: John Murray, 1876).

4 C. Darwin, *The Descent of Man, and Selection in Relation to Sex* (London: John Murray, 1871).

Figure 1. Specimen of ten pound sterling banknote in circulation between 2000 and 2018 (courtesy of the Bank of England).

exploration. In 1801 the collector and antiquarian William Bullock published the first edition of the catalogue of his Museum of Natural Curiosities, which included numerous hummingbird specimens. By 1823, the year Bullock travelled to Mexico and saw live hummingbirds for the first time, his collection amounted to 170 specimens and was the largest in Europe up to that point. But the epitome of English hummingbird collecting was the Hummingbird House of John Gould. The naturalist exhibited his immense collection of 1,500 stuffed trochilids in 1851, to coincide with London's Great Exhibition. The birds were mounted on little branches inside hexagonal display cases so that visitors could walk around them and appreciate the feathers' iridescence with the changes in light. The Hummingbird House was so successful that it attracted 75,000 visitors during that year. In 2009 Gould's hummingbirds were available again to the British public. One of the original 1851 displays was restored and exhibited in *Endless Forms: Darwin, Natural Science and the Visual Arts* at the Fitzwilliam Museum in Cambridge.

Nothing compares, however, to the experience of observing live hummingbirds, a desire that remains very much alive in Europe and the United Kingdom. In the spring of 2008 the London Zoo reopened its exotic bird exhibit, the Blackburn Pavilion, where the main attraction were three *Amazilia* hummingbirds from Peru and Ecuador. Anyone who was living in London back then can remember the spectacular advertising campaign featuring hummingbird photographs in the Underground and many public spaces. This story did not end well, though. South American hummingbirds have long disappeared from the Blackburn Pavilion, as has any trace of them on the London Zoo's webpage. Some species, even in the 21st century, cannot be globalised or, at any rate, anglicised.

Also preparing for the Darwin celebrations in 2009, the World Land Trust launched an initiative to observe hummingbirds in situ through a webcam installed in the middle of the South American rainforest. The launch of the project, celebrated in the impressive seat of the Linnean Society of London in Piccadilly, allowed guests to observe in real time hundreds of hummingbirds sipping from the enormous feeders installed in the Buenaventura ecological reserve in Ecuador. As Gould's hummingbird specimen cases were revisited in Cambridge, real hummingbirds were finally visible in London, via webcam, and admired not only in their inimitable iridescence but also their swiftness, appetite and bellicosity. These are the traits that observers in the Americas have been remarking on and recording since pre-Columbian times.

It was in these same rooms of the Linnean Society of London that, in July 1858, the main points of Darwin's evolutionary theory were read out loud for the first time. *On the Origin of Species* was published in November of the following year, mentioning alpine hummingbirds on page 403.

Few commemorations are as effective as those occurring in currency. They render past episodes and characters current through the repackaging of lives and ideas, and they imprint these in the collective memory as they circulate from hand to hand in the most mundane of registers. In this sense, what was the banknote commemorating? Darwin's claim to evolutionary theory? Or the sustained English imagination about the tropics? The distilled version of Englishness that paired Darwin and the hummingbird in the banknote connects the making of the tropics from Cook to Bullock and Gould, and to us. It also accounts for the desire to keep transplanting the endemic American hummingbird through exhibitions, both of specimens and of live birds, in Cambridge and London.

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