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Beastly Encounters: Animals in Early Modern Europe

Pierri, Florencia

Princeton, NJ : Princeton University

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BEASTLY ENCOUNTERS: ANIMALS IN EARLY MODERN EUROPE

Florencia Pierri

A DISSERTATION

PRESENTED TO THE FACULTY

OF PRINCETON UNIVERSITY

IN CANDIDACY FOR THE DEGREE

OF DOCTOR OF PHILOSOPHY

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Adviser: Anthony Grafton

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ABSTRACT:

In early modern Europe, the discipline of natural history was in flux. New plants, new animals, new texts, and new experiences challenged how Europeans understood the natural world. *Beastly Encounters: Animals in Early Modern Europe* explores how non-European animals provoked a reorientation in how Europeans studied natural history in the early modern period. It begins with the indigenous American animals encountered by early Spanish travelers to the Americas, and how they were understood as one of the many novelties coming from Spain's new conquests in the region. Then, it looks at how these animals were included in localized natural histories and travel books written not only by Spaniards, but also by other European authors who also had an interest not only in describing the often striking and fantastical creatures of the American continent, but also in trying to fit what were once seen as monsters, outside of the normal order of creation, into European categories that often had no place for them. The dissertation then turns to the issue of classification and the northern European authors of natural histories who tried to systematically include American animals into encyclopedic treatises of natural history that described the world in its entirety. These were often eclectic amalgamations of borrowing from ancient works of natural history, medieval bestiaries, and contemporaneous travel books that stressed empiricism and eyewitness accounts. Finally, the dissertation turns to a new program of systematic anatomies of exotic animals performed in the late seventeenth and early eighteenth centuries which stimulated the development and application of experimental and empirical methods in natural history. The dissertation concludes by showing that with this focus on the dissection of animal bodies, natural history and natural philosophy began to merge as the traditional interests of the former combined with the newly developing tools and methods of the latter. *Beastly Encounters* ultimately argues that the strategies developed in the sixteenth century for dealing with new animals from the American continent were coupled with the strategies developed in scientific societies in the seventeenth and early eighteenth centuries to create a new way of reading the book of nature.

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full of books. Staff at the Biblioteca Real in Madrid were kind enough to let me consult original manuscripts rather than their digital facsimiles even though that technically was against the rules. I would also like to thank everyone at the Huntington Library who made that institution such a welcoming place. I benefited greatly from chats with Daniel Lewis, and am also grateful for the floor staff who always allowed me to change my seat to the warmest corner of the reading room.

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Table of Contents

Abstract: 3
Acknowledgements: 4

Introduction **10**
Historiography and Methodology *15*
Chapter Outline *26*

Chapter 1: Approaching the Unknown **31**
Introduction: A Very Strange Fish *31*
Collecting Knowledge *42*
Strategies of Describing *57*
Conclusion *73*

Chapter 2: Armchair Naturalists and Printed Menageries **78**
Introduction: Pietro Martire and the First News of the New World *78*
New Animals for a New World *85*
Travelers and their Tales *102*
Rise of Lay Empiricism *118*
Conclusion: Did Epistemology Matter? *121*

Chapter 3: New Histories for a New World **126**
Introduction: *126*
The Natural Histories: Oviedo and Acosta *132*
Writing in an age of innumerable eyewitnesses: *141*
"What mortal understanding could comprehend such a diversity?": Animals in Oviedo's Historia *150*
A New Pliny *164*
Causes and Reasons: Animals in Acosta's Historia *168*
Noahaic Zoology and the Search for a Pious Natural History *172*
Conclusion: A New Way of Doing Natural History *179*

Chapter 4: Animals in Search of a Place **182**
Introduction: "A Creature called Armadillo or Tatu" *182*
Things in Transit: *187*
An Armadillo in Every Cabinet: *202*
The Natural Histories *208*
A New Emblematics *224*
Conclusion: Filling Out the Map of Nature *250*

CHAPTER 5: A NEW WAY OF LOOKING 252

Anatomy in the Early Modern Period 256

Elephants in the Royal Society 262

Spectacular Cadavers 268

A New Way of Looking: Collective Research, Images, and Instruments 275

Barrels of Rattlesnakes 292

Conclusion: A New Comparative Anatomy 307

CONCLUSION: THE FABULOUS FOUND 315

BIBLIOGRAPHY 331

INTRODUCTION

On June 20, 1632, Fernando Ruiz de Contreras, the secretary for Spain's Council of Indies dictated a letter from the king to the viceroy of Peru, Luis Jerónimo Fernández de Cabrera Bobadilla Cerda y Mendoza, the Count of Chinchón. Philip IV, the letter began, was worn out from "work[ing] continuously at all the requirements of running the government of this monarchy."[1] So, for some diversion, the monarch was in search of "the most ferocious animals that nature breeds, like lions, tigers, bears, and the like."[2] These animals were destined for an enclosure in the Buen Retiro, his new palace which was at that moment under construction in the outskirts of Madrid. Philip, an avid hunter, noted in his letter that he had already asked for these sorts of wild beasts to be brought back from "any foreign kingdoms where they might live," but he had neglected the wild animals that populated his own overseas domains. In this, Philip was not unusual. European monarchs had always had menageries in their courts as a way to project authority.[3] So, he ordered the viceroy to:

> inform [himself] about the diversity of ferocious animals that live in all the districts of the land you govern, and that with the greatest skill and ability possible, that you procure these animals, and cage up two of each type, and that you send them to me at the first possible opportunity, along with a description of their habits, and how

[1] "...para la diversion del animo y ocupar los ratos que puedo dar al tiempo despues de aver asistido a la continua ocupacion y despacho de tantos negocios como dependen del Gobierno de esta monarquia," Real Orden, 20-06-1632, Archivo General de Indias (AGI), Indiferente, 429, L. 38, f. 23^{r}.
[2] "Algunos de los animales feroces que naturaleza cría como son los leones, tigres, osos, y sus semejantes," Real Orden, 20-06-1632, AGI, Indiferente, 429, L. 38, f. 23^{v}.
[3] See Eric Baratay and Elisabeth Hardouin-Fugier, *Zoo: A History of Zoological Gardens in the West* (London: Reaktion, 2002).

> to take care of them, and entrusting them to a person who will, with all the care and diligence possible, bring them to me.[4]

That same day, identical letters were sent to the president of the *audiencia* of Panama and Tierra Firme, the governor of Chile, and the governor of Nueva Granada and president of the *audiencia* of Santa Fé. Thus, this request for animals was sent to the four people who governed most of the Spanish territory in the New World.

With all this forethought, it seemed likely that Philip IV would receive his pick of the wildest beasts of America. Unfortunately for him, however, that did not turn out to be the case. After a postal delay of several months in Panama, the royal request finally arrived in Lima, the governmental seat of the viceroyalty of Peru.[5] In his reply, the viceroy told the king that while he had been unable to set any plans in motion to capture the required fierce beasts, he had entrusted the matter to a member of his *audiencia* who had an enthusiasm for hunting, and that person would procure the necessary animals. However, he warned the king that because the "distances between the provinces here are of so many leagues, it will require some time to round up those [animals] that could be suitable."[6] Although Philip might have envisioned his American possessions as a uniformly wild land, the truth was that by 1634, Lima was a developed city with nary a tiger in sight, thanks in

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[4] "…aviendo echo traer para este efecto de los Reynos extranjeros los que hallan e querido se haga lo mismo de los que en esas provincias nacen y se crian y ansi os encargo que luego os informais de la diversidad de animales feroces que hubiere en todo el distrito de vuestro gobierno y que con la mayor maña y destreza que se pudiere se procure encerrar dos de cada genero y me los enviéis en la primera ocasión que se ofrezca con relación de como se crean y sustentan, encargándolos a person que con toto cuidado y diligencia me los traiga," Real Orden, 20-06-1632, AGI, Indiferente, 429, L. 38, f. 23^{r-v}.

[5] An unusual delay tied up the post in Panama for a few months. Carta del virrey de Peru a SM sobre la Real Orden, 20-6-1632, AGI, Lima, 44, 1633, n. 11.

[6] "como las distancias de las provincias son por acá de tantas leguas es menester tiempo para recoger las que parecen que pueden ser apropósito," Carta del virrey de Peru a SM sobre la Real Orden, 20-6-1632, AGI, Lima, 44, 1633, n. 11.

part to a 1522 ordinance that paid cash bounties for dead feline predators.[7] Still, the viceroy promised to try.

In 1635, the viceroy's hunter was ultimately successful and managed to trap four "tigers" in the jungles of Guayaquil, a city in modern-day Ecuador.[8] From there, the hunter put the animals into cages made of canes, put them on a ship, and sent them 1,000 miles south to Callao, a busy port city with extensive trading ties all over the world, and the main harbor of the viceroyalty of Peru.[9] That journey claimed the first feline victim, so that only three tigers arrived in Callao. That sad news reached the viceroy in nearby Lima, and he approved a budget to hire a handler for the animals and allowed for the purchase of food so that the animals would arrive in Madrid "fat and sleek."[10] From Callao, the group began what would become a very long journey to Europe: a months-long trek that included a ship to Panama City, an overland caravan on the backs of slaves to the other side of the Isthmus of Panama, a ship to Porto Bello, then to Cartagena, then to Havana. From Havana, the group finally set sail for the European continent. But, after they arrived

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[7] This ordinance paid hunters four to five pesos per animal, see Gonzalo Fernández de Oviedo y Valdés, *Historia General y Natural De Las Indias, Vol. 1* (Madrid: Real Academia de la Historia, 1851), p. 402. Even at the low end, that was one and a half times the monthly salary for a sailor working on the guard armada for Spanish bullion ships, and one quarter of what a captain on the same ship made. Both these positions were more important, and thus better paid, than normal sailing fleets, Clarence Henry Haring, "Appendix IX: Wages on Vessels in the India Navigation," in *Trade and Navigation Between Spain and the Indies in the Time of the Hapsburgs* (Cambridge, MA: Harvard University Press, 1918), p. 342.

[8] Carta del virrey de Peru, 18-05-1635, Ciudad de los Reyes, AGI, Lima, 15.

[9] Navios de entrada y salida, 1632-1635, AGI, Lima, 46. On the ports of the viceroyalty of Peru and the regular cargo run, see Guillermo Lohmann Villena, *Las defensas militares de Lima y Callao* (Seville: Escuela de Estudios Hispano-Americanos, 1964).

[10] Informe a los oficiales de la Real Hacienda, Los Reyes, 1635-05-18, AGI, Lima, 15. When the viceroy hired the handler, the care he was to provide was meant to make sure the animals were fed and watered and kept out of inclement weather. Medical options for animals were extremely limited, see Louise Hill Curth, "The Care of the Brute Beast: Animals and the Seventeenth-Century Medical Market-Place," *Social History of Medicine: The Journal of the Society for the Social History of Medicine* 15, no. 3 (2002): 375-392.

in Spain, the journey was far from over. Another ship took the tigers from Cadiz to Seville, where they boarded a cart destined for the king's palace in Madrid. A little over three hundred miles, hundreds of viewers, and one escape attempt later, the tigers and their handler stopped for the night in a city about fifteen miles from the capital. By then, nearly three years had passed since the king's original request and the animals traversed half the globe and had been in transit for eleven months. The next morning, all three tigers were dead.[11]

This story of these four ill-fated American tigers is remarkable not just in its content, but also in the fact that we can reconstruct it at all. It is difficult to get a quantitative sense of the sheer volume of *stuff* that was sent from the New World to Europe. Some items— like gold, silver, precious jewels, and spices— were measured by the box or bale, were subject to regular taxation, and traveled by register and in the ship's manifest. However, when objects traveled by direct order from the king, they often bypassed the usual accounting methods.[12] The passage of living things was even harder to track. Animals did not travel in bulk in the hold, as did dried plants or gold, and they required special attention and care, and in the case of large carnivores, their transport came with certain dangers.[13] Nevertheless, rare animals were indeed brought over in great numbers from the American continent to Spain, but these undertakings were both spontaneous and sporadic. They show up idiosyncratically and often only tangentially in the historical record because they were sent outside of the regular register of taxable

[11] Certificacion del Licenciado Marcos Godínez and Juramento de Francisco Rodriguez, AGI, Lima, 15.
[12] Miguel Angel Ladero Quesada, *El Primer Oro de América*: *Los Comienzos de la Casa de la Contratación de las Yndias, 1503-1511* (Madrid: Real Academia de la Historia, 2002).
[13] See chapter 4 of this dissertation.

goods.[14] Philip IV's royal decree was a change in that it was a concentrated and organized attempt to use the bureaucratic tools of empire to impose some order on this haphazard process and to marshal the resources of his colonial network to obtain not only rare animals, but information that could only be attained at the source: a description of their habits and how to take care of them.

This anecdote also reveals other features of the European relationship to the natural world. American animals were rare, wondrous, and elicited attention—that was why Philip IV wanted to exhibit fierce American animals in Madrid, and why hundreds of Spaniards visited the tigers brought over for that purpose. They were also confounding in many ways. Were the animals that almost made it to Madrid tigers? If not, what were they? Were they a spotted variant of the stripped felines that European knew lived on the Asian continent? Were they something new entirely? Questions like these plagued early modern Europeans who came into contact not just with American tigers, but also with American creatures that did not yet have any European names. As people in Europe began to learn more about the animals of the New World from travel accounts and published natural histories, the accumulation of information brought out tensions in the way Europeans understood not just animals, but natural history as a whole.

Over the course of the two centuries following the start of European expansion into the American continent, Europeans learned more and more about the fauna of a

[14] Rather than inhabiting a world of commerce, these animals were more part of the early modern gift economy. On the place of money and commercialization in early modern natural histroy, see Brian W. Ogilvie, *The Science of Describing: Natural History in Renaissance Europe* (Chicago: University of Chicago Press, 2008), especially pp. 78-80. On the practice of scientific gift exchange, see Paula Findlen, "The Economy of Scientific Exchange in Early Modern Italy," in *Patronage and Institutions: Science, Technology, and Medicine at the European Court, 1500-1750*, Bruce T. Moran, ed. (Rochester, NY: Boydell Press, 1991), pp. 5-24.

continent that most of them would never visit, thanks to information and specimens brought back by sailors and merchants and spread throughout Europe by collectors and naturalists. Travelers brought home what animals they could, and they wrote extensively about the rest. As a result, Europeans learned of animals about which they had previously known nothing, and that led to a further series of questions. Whose expert knowledge could guarantee that the information sent back to Europe was reliable? And once information did make it to Europe, how did naturalists incorporate these animals into encyclopedias of natural history? Over time, it became clear that older ways of understanding animals could not adequately incorporate these new animals, and the influx of information about them changed the intellectual landscape of Europe and forced a reorientation of the discipline of natural history. In this dissertation, I explore European perceptions of animals in the sixteenth and seventeenth centuries and examine the ways in which scientific understanding of animals developed and changed as a result Europeans' encounters with the fauna of the American continent. It was in this period that the foundations were laid for what would later be called zoology, and this dissertation traces the early issues of description, observation, experience, and classification that arose with the influx of previously unknown animals from the Americas.

Historiography and Methodology

By the medieval period, Europeans had a well-developed understanding of the natural world. Most Europeans interpreted the Biblical account of Creation to mean that the plants and animals of the world were meant for human use. On a practical level, the

natural world was seen as a repository for human food, medicine, labor, and sport.[15] However, at the close of the fifteenth century, Europeans had also amassed a large amount of information in the form of entertaining, but moralistic, tales about all manner of creatures.[16] The medieval bestiary was a genre derived from the *Physiologus*, an anonymous compilation of stories about the natural world that blended Christian didacticism with pagan stories. Over the centuries more material made it into the bestiary tradition, as writers drew from classical works like Pliny the Elder's *Natural History* and early medieval encyclopedias like Isidore of Seville's *Etymologies*.[17]

Bestiaries were not works of natural history in the model of Pliny the Elder's *Natural History*.[18] Nor did authors of early modern natural histories necessarily strive to replicate the bestiary tradition. Nevertheless, these medieval compilations were not just repositories of stories to scare Christians into following a godly path. They were, as Joyce Sailsbury argued, "'scientific' in medieval terms, when 'science' meant the attempt to

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[15] Keith Thomas, *Man and the Natural World: A History of the Modern Sensibility* (New York: Pantheon Books, 1983), pp. 17-30.

[16] On bestiaries, see Ron Baxter, *Bestiaries and their Users in the Middle Ages* (Gloucestershire: Sutton, 1998); Debra Hassig, "Introduction," in *The Mark of the Beast: The Medieval Bestiary in Art, Life, and Literature*, Debra Hassig, ed. (New York and London: Routledge, 1999); Joyce E. Salisbury, *The Beast Within: Animals in the Middle Ages,* second edition (London and New York: Routledge, 2011), pp. 88-91; Florence McCulloch, *Medieval Latin and French Bestiaries* (Chapel Hill: University of North Carolina Press, 1962); Elizabeth Morrison, "The Medieval Bestiary: Text and Illumination," in *Book of Beasts*: *The Bestiary in the Medieval World,* Elizabeth Morrison, ed. (Los Angeles: The J. Paul Getty Museum, 2019), pp. 3-12; Ilya Dines, "The Function of Latin Bestiaries in Medieval Miscellanies," in *Book of Beasts*, pp. 67-76.

[17] Michael J. Curley, "Introduction," in *Physiologus: A Medieval Book of Nature Lore*, Michael J. Curley, tr. (Chicago: University of Chicago Press, 2009); Morrison, "The Medieval Bestiary," pp. 4-5.

[18] On Pliny's *Natural History,* see Mary Beagon, "*Labores pro bono publico*: The Burdensome Mission of Pliny's *Natural History*," in *Encyclopaedism from Antiquity to the Renaissance*, Jason König and Greg Woolf, eds. (Cambridge: Cambridge University Press, 2013), pp. 84-107; Roger French, *Ancient Natural Histories: Histories of Nature* (London and New York: Routledge, 2005), pp. 160-208. On the use of Pliny in the context of the late medieval period, see Mary Beagon, "Peter Martyr's Use of Pliny," *International Journal of the Classical Tradition* 21, no. 3 (2014): 223-244.

understand all truth, including in particular metaphysical truth."[19] They were also immensely popular, and the stories they contained traveled far and wide. These were intended to educate Europeans (literate or not) in Christian truths, and to provide examples of how a moral person should or should not act. They were sources of visual symbolism, informed, of course, by Christian didacticism. As a result, bestiaries laid the foundations for generations of sermons, inculcating in the churchgoing public a lay understanding of the animals of the world, even if the main message was the moral behavior they modeled.[20] This meant that animals had a different intellectual trajectory in late medieval Europe than plants did. The closest floral analog to the bestiary was the herbal, but that had an explicitly medicinal purpose because plants were the main source of much of the medieval pharmacopeia. As a result, studies of plants were also much more firmly entrenched in the university curriculum of the era.[21]

Accordingly, historians of early modern science have studied natural history primarily through the lens of botany.[22] In the foundational text for the history of Renaissance natural history, Brian Ogilvie argued that natural history as a discipline emerged in the late fifteenth century, the result of the confluence of humanist textual

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[19] Salisbury, *The Beast Within*, p. 89.
[20] In *Bestiaries and their Users*, Baxter traces patterns of consumption to make an argument about how their owners used these types of books, pp. 183-194.
[21] On the link between botany and medicine in the late medieval period, see Karen Reeds, *Botany in Medieval and Renaissance Universities* (Garland: New York, 1991).
[22] Allen Debus, *Man and Nature in the Renaissance* (Cambridge: Cambridge University Press, 1978); Barbara Shapiro, "History and Natural History in Sixteenth and Seventeenth Century England: An Essay on the Relationship Between Humanism and Science," in *English Scientific Virtuosi in the Sixteenth and Seventeenth Centuries,* Barbara Shapiro and Robert G. Frank, Jr., eds. (Los Angeles: William Andrews Clark Memorial Library, 1979), pp. 1-55; Andrew Cunningham, "The Culture of Gardens," in *Cultures of Natural History*, Nicholas Jardine, James A. Secord, and E. C. Spary, eds. (Cambridge: Cambridge University Press, 1996), pp. 38-56; Alix Cooper, *Inventing the Indigenous: Local Knowledge and Natural History in Early Modern Europe* (Cambridge: Cambridge University Press, 2007); Ogilvie, *Science of Describing*.

criticism, the revived study of manuscripts of Greek and Roman medical tracts, and pedagogical reform in medical schools in northern Europe. He characterized natural history as a "science of describing," whose techniques "were worked out primarily in the realm of botany." He noted that "Renaissance naturalists studied animals and minerals, but the core of Renaissance natural history was the *res herbaria*, the study of plants."[23] Similarly, in her book about authors of localized natural histories, Alix Cooper argued that "descriptions of local fauna were relatively rare and unsystematic throughout most of the early modern period, consisting for the most part of treatises on less-common species near the margins of Europe."[24] Moreover, as Londa Schiebinger and Claudia Swan argued, botany was not only "big science," but also "big business" in the early modern world.[25] This status, they argued, had much to do with Europe's burgeoning colonial ambitions, as the economical and medicinal uses of plants made botany a close handmaiden of early colonialism. As a result, historians of the early modern have closely studied botany and its relationship to empire, but this commercial interest also meant that the less commodifiable animal world has escaped attention in this historiography.[26] Botany did indeed undergo a momentous transformation in this era, with the influx of new plants from northern Europe and a new emphasis on observation and description, and it was an important colonial

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[23] Ogilvie, *Science of Describing*, p. 23.
[24] Cooper, *Inventing the Indigenous*, p. 116, n.1.
[25] Londa Schiebinger and Claudia Swan, "Introduction," in *Colonial Botany: Science, Commerce, and Politics in the Early Modern World*, Londa Schiebinger and Claudia Swan, eds. (Philadelphia: University of Pennsylvania Press, 2008), p. 3.
[26] See the essays in Londa Schiebinger and Claudia Swan, eds., *Colonial Botany*; Paula de Vos, "The Science of Spices: Empiricism and Economic Botany in the Early Spanish Empire," *Journal of World History* 17, no. 4 (2006): 399-427; Kevin Sheehan, "Voyaging in the Spanish Baroque: Science and Patronage in the Pacific Voyage of Pedro Fernández de Quirós, 1605–1606," in *Science in the Spanish and Portuguese Empires, 1500-1800*, Daniela Bleichmar, Paula De Vos, Kristin Huffine, and Kevin Sheehan, eds. (Stanford: Stanford University Press, 2008); Daniela Bleichmar, *Visible Empire: Botanical Expeditions and Visual Culture in the Hispanic Enlightenment* (Chicago: University of Chicago Press, 2012).

pursuit that still demands close attention from scholars. However, this dissertation argues that botany was only one facet of the development of natural history in the sixteenth and seventeenth centuries.[27] Early modern scholars who studied animals could not simply take their cue from the botanists because animals raised problems and questions that their botanical counterparts did not.

This dissertation has three aims. It shifts the way early modern historians approach the study of natural history itself to include the study of animals not as a derivative of botanical studies, but as a discipline of interest in its own right. With some exceptions, most works in the history of early modern science have not yet taken the "animal turn," as Harriet Ritvo argued.[28] Works in the history of science have examined animals' status in the laboratory as model specimens and looked at how scientists used them to construct knowledge.[29] More recent work has focused on the uses and abuses of anthropomorphism.[30] However, most works in animal studies remain rooted in the modern

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[27] Nature, in the conception of the era, was made up of three kingdoms: plants, animals, and minerals. On the status of minerology in the genre of natural history, see David Elliston Allen, "The Lost Limb: Geology and Natural History," in *Images of the Earth: Essays in the History of Environmental Science*, Ludmilla Jordanova and Roy Porter, eds. (Oxford: British Society for the History of Science, 1997), pp. 203-215.

[28] Harriet Ritvo, "On the Animal Turn," *Daedalus* 136, no. 4 (2007): 118-22.

[29] Robert E. Kohler, *Lords of the Fly: Drosophila Genetics and the Experimental Life* (Chicago: University of Chicago Press, 1994); Karen Rader, *Making Mice: Standardizing Animals for American Biomedical Research, 1900-1955* (Princeton: Princeton University Press, 2004); Lynda Birke, "Telling the Rat What to Do: Laboratory Animals, Science, and Gender," in *Gender and the Science of Difference: Cultural Politics of Contemporary Science and Medicine*, Jill A. Fisher, ed. (New Brunswick, NJ: Rutgers University Press, 2011), pp. 91-107.

[30] See the essays in Lorraine Daston and Gregg Mittman, eds., *Thinking With Animals: New Perspectives on Anthropomorphism* (Columbia: Columbia University Press, 2005); See also the essays in Angela N. H. Creager and William Chester Jordan, eds., *The Animal/Human Boundary: Historical Perspectives* (Rochester: The University of Rochester Press, 2002); Donna J. Harraway, *When Species Meet* (Minneapolis and London: University of Minnesota Press, 2008). In the early modern context, see the essays in Erica Fudge, ed., *Renaissance Beasts: Of Animals, Humans, and Other Wonderful Creatures* (Urbana and Chicago: University of Illinois Press, 2004); Abel A. Alvarez, *The Animals of Spain: An Introduction to Imperial Perceptions and Human Interaction with Other Animals, 1492-1826* (Leiden: Brill, 2011).

period, examining the cultural, not the epistemological, uses of animals.[31] Referencing the early modern period, historians have investigated the status of specific species like horses, dogs, and parrots, and have shed light on early modern understandings of individual animals and their uses, but not looked at how animals were understood as a distinctive class of beings, and how they influenced the systematic study of the natural world.[32]

This dissertation instead examines European understandings of animals in general in the early modern period through the writings of learned scholars and laypeople alike. I argue that European natural history was a multifaceted discipline whose frameworks developed across both the European and American worlds.[33] In the period of study this dissertation considers, these geographical spaces themselves were also in flux, as were existing European conceptions of the world. The myriad accounts of the New World,

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[31] For an overview of recent trends in animal studies, see Erica Fudge, "A Left-Handed Blow: Writing the History of Animals," in *Representing Animals,* Nigel Rothfields, ed. (Bloomington: Indiana University Press, 2002); Ritvo, "The Animal Turn"; Lauren Derby, "Bringing the Animal Back in: Writing Quadrupeds into Caribbean History," *History Compass* 9 no. 8 (2011):602-621; Zeb Tortorici and Martha Few, "Writing Animal Histories," in *Centering Animals in Latin American History,* Martha Few and Zeb Tortorici, eds. (Durham and London: Duke University Press, 2013); Paul Waldeau, *Animal Studies: An Introduction* (Oxford: Oxford University Press, 2013).

[32] On the horse, see Robert Cunninghame Graham, *Horses of the Conquest: A Study of the Steeds of the Spanish Conquest* (Norman: University of Oklahoma Press, 1949); Joan Thirsk, *Horses in Early Modern England: For Service, for Pleasure, for Power* (Reading: University of Reading, 1977); the essays in Karen Raber and Treva H. Tucker, eds., *The Culture of the Horse: Status, Discipline, and Identity in the Early Modern World* (New York: Palgrave Macmillan, 2005); Ann Norton Greene, *Horses in the City: Harnessing Power in Industrial America* (Cambridge, MA: Harvard University Press, 2008). On dogs, see John Beusterien, *Canines in Cervantes and Velázquez: An Animal Studies Reading of Early Modern Spain* (Farnham: Ashgate, 2013). On birds, see Marcy Norton, "Going to the Birds: Animals as Things and Beings in Early Modernity," in *Early Modern Things: Objects and their Histories, 1500–1800*, Paula Findlen, ed. (London: Routledge, 2013), pp. 53–83; Paul J. Smith, "On Toucans And Hornbills: Readings In Early Modern Ornithology From Belon To Buffon," in *Early Modern Zoology: The Construction of Animals in Science, Literature and the Visual Arts*, Karl A. E. Enenkel and Mark S. Smith, eds. (Leiden, The Netherlands: Brill, 2007), pp. 75-119. On pigs, see Robert W. Malcolmson and Stephanos Mastoris, *The English Pig: A History* (London: Hambledon Press, 1998). On dogs, see John Grier Varner and Jeanette Johnson Varner, *Dogs of the Conquest* (Norman: University of Oklahoma Press, 1983).

[33] This is a point of departure from Laurent Pinon's *Livres de Zoologie de la Renaissance: Une Anthologie, 1450-1700* (Paris: Klincksieck, 1995), which prioritizes published works by continental European scholars.

along with the increased movement of natural things, shifted a European understanding of the natural world that was based on textual knowledge to one predicated on observation and experience.[34] This move also occurred in botany, as Ogilvie has shown, but the questions new animals raised among the lay public presented a more salient challenge to existing structures of knowledge. This is the point that Karl Enenkel and Paul Smith made in their introduction to a book of essays about early modern zoology. They argued that it was not "adequate to consider early modern zoology only as a kind of appendix to early modern biology."[35] These two studies were rooted in different medieval traditions and were treated differently in the early modern period as well.

Shifts in understanding were indeed taking place amongst learned botanists consulting their books and manuscripts against new plants. However, in including the history of animals in a study of natural history, we uncover another side of the history of that discipline—one that highlights the diverse ways in which Europeans from the common sailor to the lofty scholar grappled with uncertainty and tried to create a new structure from the tatters of the old. Because of the medieval bestiary tradition, all Europeans, literate or not, had a sense of the kinds of animals that populated the natural world.[36] Moreover, people in the sixteenth and seventeenth centuries lived in much closer

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[34] Anthony Grafton, *New Worlds, Ancient Texts: The Power of Tradition and the Shock of Discovery* (Cambridge, MA: Belknap Press of Harvard University Press, 1995); Antonio Barrera-Osorio, *Experiencing Nature: The Spanish American Empire and the Early Scientific Revolution* (Austin: University of Texas Press, 2006); John Huxtable Elliott, *The Old World and the New: 1492-1650* (Cambridge: Cambridge University Press, 2008).

[35] Karl A. Enenkel and Paul J. Smith, "Introduction," in *Early Modern Zoology: The Construction of Animals in Science, Literature and the Visual Arts*, Karl A. Enenkel and Paul J. Smith, eds. (Leiden: Brill, 2007), p. 3. The term zoology is somewhat anachronistic for this era. Like the term biology, zoology was not widely used to indicate an exclusive study of animal life until the eighteenth century.

[36] This is informed by the knowledge-making of empirics in London's Lime Street described by Deborah Harkness, *The Jewel House: Elizabethan London and the Scientific Revolution* (New Haven: Yale University Press, 2008).

proximity to animals than we do today. This was true of both Europeans and Amerindians, though both groups related to animals in fundamentally different ways, as Marcy Norton argued in the context of the Caribbean and South American notion of the *iegue*.[37] Because of this familiarity, as this dissertation shows, animals presented a more obvious case than plants of novelties that did not fit into existing structures of knowledge. As a result, the observational experience of travelers to the New World provided a complement to the humanist culture of the fifteenth and sixteenth centuries in creating the discipline of natural history.

Secondly, this dissertation serves as a point of departure for a broader examination of scientific developments in the New World**.** In this, it follows in the path laid by scholars like Jorge Cañizares-Esguerra, who led the charge to include the contributions of the Portuguese and Spanish in the Atlantic world in the narrative of early modern science.[38] The scholarship concerning the Iberian contribution to scientific endeavors has grown since Cañizares-Esguerra's call. The benefits of an Atlantic approach that engages transcontinental historiographies is immense and has led to a great quantity of work that deals with knowledge-making both within the Iberian Peninsula and the Atlantic world.[39] As European powers expanded their empires from the early sixteenth century onwards,

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[37] Marcy Norton, "The Chicken or the *Iegue*: Human Animal Relationships and the Columbian Exchange," *The American Historical Review* 120, no. 1 (2015): 28-60. For Europeans' proximity to animals in the early modern period, see Thomas, *Man and the Natural World*.

[38] Jorge Cañizares-Esguerra, "Iberian Science in the Renaissance: Ignored How Much Longer?," *Perspectives on Science*, 12, no. 1 (2004): 86-124; Jorge Cañizares-Esguerra, *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World* (Stanford: Stanford University Press, 2006).

[39] For an overview of recent developments in the historiography, see María M. Portuondo's introduction to the special issue on Iberian science, "Iberian Science: Reflections and Studies," *History of Science* 55, no. 2 (2017): 123-132. See also William Eamon and Víctor Navarro Brotons, eds., *Beyond the Black Legend: Spain and the Scientific Revolution / Mas allá de la Leyenda Negra: España y la Revolución Científica* (Valencia: Instituto de Historia de la Ciencia y Documentación López Piñero, 2007).

travelers became critical interlocutors in the process of making knowledge. In their attempts to comply with orders to describe the New World, they began a critical process of synthesizing and categorizing the natural world. Daniela Bleichmar, Paula de Vos, Londa Schiebinger, and Susan Scott Parrish, among others, have expanded on the earlier historiography of the Columbian exchange to elucidate the role of plants (especially medicinal ones) in early modern natural history in a colonial context.[40] Still, even though the North American continent was home to new animals as well as new plants (at least as far as Europeans were concerned), the former have not been studied like the latter.

In tracing the history of animals, this dissertation considers the New World in a global framework. It begins with European travelers making sense of New World animals and their attempts to determine not only what these animals were, but also how they could make them intelligible not only to their sponsors, but to the public at large. The strange new creatures found in Spanish (and later French, Dutch, and English) America forced a reorientation of understanding that would impact epistemological practices far outside of the swashbuckling seas where this knowledge was first created. Thus, this dissertation brings the worlds of informally educated sailors, merchants, and travelers together with the worlds of the highly educated collectors and naturalists back in Europe. Borrowing from Pamela Smith's idea of the "intellectual revolution from the bottom up" that artisans effected on natural philosophy, it traces how people whose experience with the natural world was empirical changed what it meant to study the book of nature.[41] For example,

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[40] Bleichmar, *Visible Empire;* Paula De Vos, "The Science of Spices"; Susan Scott Parrish, *American Curiosity: Cultures of Natural History in the Colonial British Atlantic World* (Chapel Hill, NC: University of North Carolina Press, 2006).
[41] Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago: University of Chicago Press, 2004), p. 239.

Conrad Gesner, who appears in chapter 4 had great reverence for both ancient sources and his fellow Latinate humanists, and he showed named and thanked the individual scholars, doctors, and apothecaries who helped him. While he only thanked people like hunters and hawkers in the aggregate, he nevertheless could not have written his history of animals without the help of people whose practical knowledge of animals was more robust than their scholarly bona fides.[42] It was this cross-cultural contact of American animals with European knowledge, and less formally educated sailors, hunters, or merchants and highly educated naturalists that transformed the medieval understanding of animals to what would become the Enlightenment focus on comparative anatomy.

Thirdly, this dissertation seeks to reexamine the roots of taxonomy. Natural history is often told as an eighteenth-century story, with Carolus Linnaeus's transformation of animal and plant classification looming like a historiographical black hole that swallows earlier attempts at classification. Historians of science have identified the eighteenth century as the golden era of classification, following Foucault, who saw in the eighteenth century the initial stirrings of the "possibility of classifying living things."[43] Even those who complicated Foucault's thesis took as their point of origin the eighteenth century.[44] By and large, the historiography treats the era as "the great age of classification," with "natural historians attempting to lay the grid of reason over the unwieldy stuff of nature

[42] My thanks to Anthony Grafton for pointing this out.
[43] Michel Foucault, *The Order of Things: An Archeology of the Human Sciences* (New York: Vintage Books, 1990), chapter 5, especially pp. 126-132.
[44] See, for example, James L. Larson, *Interpreting Nature: The Science of Living Form from Linnaeus to Kant* (Baltimore: The Johns Hopkins University Press, 1994), which takes as its starting point the work of Georges Louis Leclerc (the Comte de Buffon), Albrecht von Haller, and Carolus Linnaeus, but argues that they had more in common with one another than did the generation of naturalists that followed them. See also Scott Atran, *Cognitive Foundations of Natural History*: *Towards an Anthropology of Science* (Cambridge: Cambridge University Press, 1990).

[with] new and simple principles that would hold universally."[45] Paul Lawrence Farber argued that it was Linnaeus's classificatory scheme and French naturalist Georges-Louis Leclerc, the Comte de Buffon's encyclopedic works of natural history that "laid the foundation for the emergence of natural history as a scientific discipline," as if they were the first to grapple with classifying the animals of the world, or to write texts about them.[46]

Works on the history of biology focus primarily on the post-Linnaean period, when classification became, if not stable, at least coherently codified with the system of binomial nomenclature. Although Linnaeus's zoological schemata were not as influential as his botanical ones, the lasting success of his organizing principle carried his zoological classification.[47] In this telling, later developments in comparative anatomy were the direct result of the classifying project of the eighteenth century.[48] Other works have complicated this narrative by showing that classification remained a contested territory in the late eighteenth and nineteenth centuries, and anatomizing animals was not a panacea for knowing how animals ought to be sorted.[49]

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[45] Londa Schiebinger, *Nature's Body: Gender in the Making of Modern Science* (New Brunswick, NJ: Rutgers University Press, 2004), p. 177.
[46] Paul Lawrence Farber, *Finding Order in Nature: The Naturalist Tradition from Linnaeus to E.O. Wilson* (Baltimore and London: The Johns Hopkins University Press, 2000), p. 20.
[47] For the development of Linnaeus's system, see Lisbet Koerner, *Linnaeus: Nature and Nation* (Cambridge, MA and London: Harvard University Press, 1999), especially chapters 1 and 2. On the classification of animals in particular, see pp.15, 54-55. See also Frans Stafleu, *Linnaeus and the Linnaeans: The Spreading of Their Ideas in Systematic Botany, 1735-1789* (Utrecht, Oosthoek, 1971); and Larson, *Interpreting Nature*. On Buffon, see Jacques Roger, *Buffon: A Life in Natural History* (Ithaca: Cornell University Press, 1997).
[48] Historians have of course noted that anatomizing animals was not an eighteenth-century invention. See Francis J. Cole, *A History of Comparative Anatomy from Aristotle to the Eighteenth Century* (London: MacMillan, 1944).
[49] Harriet Ritvo makes this case for the late eighteenth century with animals like kangaroos and platypuses in *The Platypus and the Mermaid and Other Figments of the Classifying Imagination* (Cambridge, MA: Harvard University Press, 1997). Graham Burnett notes that the taxonomy of the whale was also still up for grabs in the nineteenth century in *Trying Leviathan: The Nineteenth Century New York Court Case That Put the Whale on Trial and Challenged the Order of Nature* (Princeton and Oxford: Princeton University Press, 2007).

This dissertation traces the problem in the other direction and seeks to better understand the origins for the enlightenment process of categorization. Just as the early eighteenth century systematizers did not solve the problems of taxonomy, neither were they the first to grapple with issues of classification. This dissertation also traces the turn towards comparative anatomy to the breakdown of zoological categories that began when sailors first left Europe and stumbled across the strange, unknown animals of the North American continent. After older cognitive models proved unsuccessful in dealing with these animals, new practices of experience, description, and observation culminated in a new way of classifying that rejected the primacy of external characteristics for something else.[50] Nevertheless, this dissertation shows that this was not a clean break, and the older traditions of the medieval bestiary, especially the moral and emblematical significance of animals, remained a scholarly concern. By starting with the intellectual problems of the early sixteenth century, this dissertation traces a longer history for, situating it as part of, rather than separate from, the concerns of the early modern period.[51]

Chapter Outline

This dissertation seeks to show how European understandings of animals changed over the course of the sixteenth and seventeenth centuries. It also engages broader scholarship on natural history and classification by showing how the vexed process of

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[50] Peter Sahlins, *1668: The Year of the Animal in France* (New York: Zone Books, 2017); Noah Moxham, "Edward Tyson's *Phocaena:* A Case Study in the Institutional Context of Scientific Publishing," *Notes and Records of the Royal Society of London* 66, no. 3 (2012): 235-252.

[51] In this, the dissertation pushes back against the centrality of emblematic associations for Renaissance natural history as posited in William Ashworth, "Natural history and the emblematic worldview," in *Reappraisals of the Scientific Revolution*, David C. Lindberg and Robert S. Westman, eds. (Cambridge: Cambridge University Press, 1990), pp. 303-332. Ashworth, following Foucault, argued that a fundamental break occurred as a result of the introduction of New World animals into Europe, and that these animals sounded the death knell for emblematic natural history.

describing New World animals influenced how naturalists back in Europe understood natural history and eventually led to a reformulation of how scholars studied animals. The structure of this dissertation follows from this aim, with the first two chapters devoted to how travelers described the unknown animals they encountered on their voyages. The next two chapters describe European attempts to include American animals in broader works of natural history, and a final chapter reflects on a new way of ordering animals that relied more on anatomy than surface characteristics. These chapters, arranged in a thematic-chronological structure, show the slow breakdown of Europeans' prevailing understanding of the world's fauna, which they inherited from medieval encyclopedists. In attempting to understand the unfamiliar, sailors and scholars alike created new modes of understanding the natural world.

Chapter one begins in the early years of the Spanish conquest and focuses on the practices of information gathering adopted by pilots, sailors, and other early travelers to the New World. It takes as its starting point the documents (including rutters and narrative accounts of travel) that were required of all Spanish travelers to uncharted territories. In them, travelers were ordered to describe everything from the geography to the animals of the regions they visited. After laying out the practices of information gathering and the institutional, political, and economic rationales for these documents, the chapter turns to how travelers filled them out. At first, many travelers assumed that new animals were monsters—singular aberrations from the normal course of nature.[52] However, as Spaniards spent more time on the American continent, it became clear that

[52] Paula Findlen, "Jokes of Nature and Jokes of Knowledge: The Playfulness of Scientific Discourse in Early Modern Europe," *Renaissance Quarterly* 43, no. 2 (1990): 292-331; Lorraine Daston and Katherine Park, *Wonders and the Order of Nature, 1150-1750* (New York: Zone Books, 1998).

these were not aberrations, but part of the normal course of nature. The chapter then turns to the two strategies of description that Europeans used in order to explain the unfamiliar. The first relied on similes, and elided differences between the two continents as much as possible. The second strategy was to create mosaic-like hybrids and describe autochthonous American animals with recourse to parts of more commonly known animals stitched together. These strategies were, in the end, unsuccessful, and unable to effectively deal with the realities of the differences between many of the animals of the American continent and those familiar to Europeans.

Chapter two explores the written output of travelers, but in a different genre: travel literature. As this chapter shows, it was through works like these that a broader European audience learned about animals with which they were entirely unfamiliar and whose existence was highly problematic. These works were extremely popular and showed that there was not only a keen interest in, but also a need for, a more systematic study of the animals of the world. These books were not merely entertainment, however. They were a useful tool for the promulgation of zoological knowledge, and were treated as a serious source of information by lay readers and learned naturalists alike. In these works, we see a shift from the open-ended inquiry—characteristic of the manuscript documents compiled by conquistadors for the Spanish government—to a new kind of interest that was more interested in taxonomy than description. Their work brought to light disagreements about the ways certain new animals ought to be classified.

While travel writers were enthusiastic recorders of the natural world, they were hardly systematic ones. Increasingly, Europeans (especially formally educated ones) began to see that the New World was too varied and its nature too dissimilar to Europe's to be assessed by one person in one travel account. Chapter three turns to two people who

specifically attempted to write not just a travel narrative, but a comprehensive account of the then-known American continent to rival the works of Pliny or Aristotle. The ultimately unpublished *La historia general y natural de las Indias*, written by the chronicler Gonzalo Fernandez de Oviedo, and the 1590 *Historia natural y moral de las Indias,* written by the Jesuit José de Acosta were both attempts to create for the New World what Pliny the Elder had done in his *Natural History*. Both of these authors, like the travelers that came before them, touted their first-hand experience. They were not only travelers to, but inhabitants of, the North American continent, and they self-consciously took a different and more systematic approach when writing about the region. These two works were their attempts to create a dedicated natural history of the region that was based on ancient models, but also reflected the needs of their era and their audience—imperial, for Oviedo, and ecclesiastical for Acosta.

However, the limits of a natural history written in the American continent quickly became apparent to European scholars, especially those who wanted to document the full sweep of naturalia and include American flora and fauna into universal books of natural history. This process, described in chapter four, was fraught with difficulties. Using the armadillo as a lens, the chapter investigates the epistemic changes produced by the circulation of animals and animal knowledge within Europe itself. Armadillos, as the chapter shows, proved especially resistant to then-current European modes of understanding animals that privileged external forms, an issue that was made all too clear thanks to the hundreds of armadillo carapaces that flooded Europe in the sixteenth and seventeenth centuries. Both owners of cabinets of curiosities and authors of encyclopedias of animals had trouble placing these animals within any one category. Yet Europeans did not find it hard to ascribe emblematic associations to armadillos —a way of understanding

the world that was central to the medieval bestiary tradition, and that was also deeply traditional.[53] Armadillos represented a fundamental problem for Europeans who wanted to make sense of the natural world because, in their external forms, they straddled so many demarcating lines of earlier classification schemes. Consequently, they revealed the inherent weakness of these systems.

Chapter five describes the culmination of these difficulties. As the European observers in chapter four struggled to coherently catalog the world, it became clear that the ways of understanding animals that Europeans had inherited from the bestiary tradition could not easily work for New World animals. Over the second half of the seventeenth century, general attitudes about how to undertake the study of nature changed. Animals were routinely anatomized not only for their medical applications, but as an end in and of itself, worthy of interest, attention, and institutional support. Moreover, the goals of newly forming scientific societies were instrumental in the creation of the assumptions and rubrics about how animal investigation was to be performed. The chapter argues that the development and application of experimental and empirical methods applied to anatomy, as well as new sets of instruments for investigating and resolving disputes about the natural world, ushered in a new way of reading the book of nature. Out of this new focus on the dissection of animal bodies, natural history and natural philosophy began to merge. The traditional interests of the former joined with the newly developing tools and methods of the latter.

[53] On the emblematic tradition, see Ashworth, "Natural history and the emblematic worldview." See also Natalie Lawrence, "Exotic Origins: The Emblematic Biogeographies of Early Modern Scaly Mammals," *Itinerario* 39, no. 1 (2015): 17–43.

CHAPTER 1: APPROACHING THE UNKNOWN

Introduction: A Very Strange Fish

In October of 1533, two ships—the San Lázaro and the Concepción—set sail from the port of Santiago de la Buena Esperanza, now in the modern-day Mexican state of Colima. They had been sent to succor an ill-fated expedition led by Diego Hurtado de Mendoza to the coastal regions north of New Spain. Like most sixteenth-century Spanish missions, both vessels kept a rutter, or pilot's book. This document, created for the use of bureaucratic officers in Spain, was an internal document where the head pilot (which, for the San Lázaro, was Martín de Acosta) recorded items of navigational interest for each day, all with an eye for the eventual maps of uncharted regions that this document would help create.[1] In one of these entries, after complaining about the endless days of windless calm in early November, Acosta wrote that "there passed next to the ship a fish that we were unable to ever identify. Some people said it was a merman, others said it was a wolf."[2] This was not the only time the group saw this so-called fish. Later that same month, Acosta penned another entry after a fruitless trip to a nearby island in search of fresh food and water. Though the island on which they had pinned their hopes turned out to be barren, in a gulf between it and the mainland, they once more saw more of these strange wolf-human hybrids. "We found again," he wrote in the rutter,

> that fish that I mentioned before. It came close to the ship and we saw it so close up that we were able to spend a great deal of time drawing it. It frolicked about just

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[1] María M. Portuondo, *Secret Science: Spanish Cosmography and the New World* (Chicago: University of Chicago Press, 2009), p. 51.

[2] "Paso junto a la nao un pexe q[ue] nunca supimos dezir q[ue] era. Unos dezian q[ue] hera hombre marinero, otros q[ue] hera lobo." Derrotero del navío San Lázaro, Archivo General de Indias (AGI), Patronato 20, n. 5, r. 7, f. 3^{r}.

like a monkey, and it gestured wildly with its hands for a while, and it looked at us […] as if it were possessed of some sort of reason.[3]

After a time, a bird drove the animal off, but the pilot and sailors watched it at a distance for the next hour, long enough for someone to sketch its likeness in the margin. Crowded into the bottom of a page that mainly dealt with navigational details of leagues traveled and degrees measured was a figure of this fish. **[Figure 1.1]** As it was drawn, it had arms with clearly differentiated fingers, an eye framed by an eyebrow, and a decidedly non-piscine umbilicus. Below that, it had a scaly tail to propel itself through the water. Taken as a whole, the image was reminiscent of the mermaids and sirens that swam the waters of medieval bestiaries—nearly impossible creatures that, like Acosta's fish, were, almost by definition, made up of incongruous body parts stitched together to create a bizarre hybrid. **[Figure 1.2]** Exotic creatures like these were, of course, strange only relative to the observer, and the learned medieval line on natural marvels like mermaids was that they

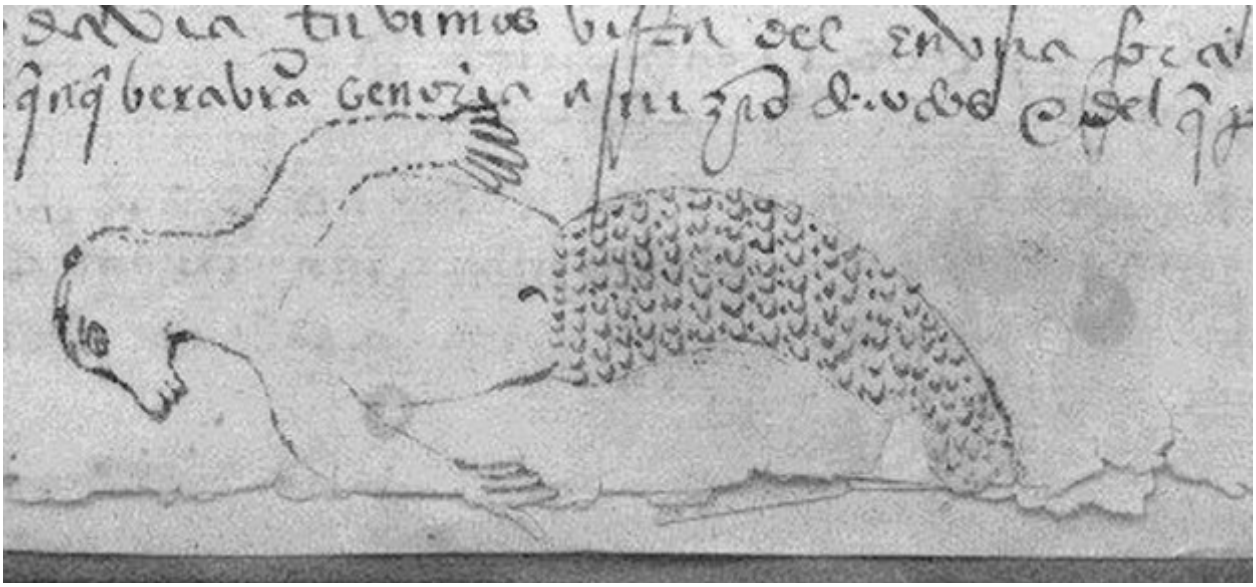

Figure 1.1: Drawing of a Fish, 1553, AGI, Patronato, 20, n.5, r.7

[3] "Hallamos otra ves aquel pexe q[ue] dixe en esta otra parte que salio junto de la nao e lo vimos tan junto q[ue] lo podiamos debujar largamente. El qual se regocijaba ni mas ni menos que un mono, sabuliendose e valiando con las manos en un rato, e mirandonos […] como que tuviese una mana de sentido." Derrotero del San Lázaro, AGI, Patronato 20, n. 5, r. 7, f. 3r.



Figure 1.2: Siren, c.1460, Bodleian, MS Douce *377*

were part of, rather than a violation of, the normal order of nature.[4] Still, this was not the normal order of nature with which Acosta and his crew were accustomed. Neither was it the normal order of things to the members of the *Casa de la Contratación* in the Spanish port

[4] Lorraine Daston and Katharine Park, *Wonders and the Order of Nature, 1150-1750* (New York: Zone Books, 2001), pp. 48-51.

town of Seville, the agency responsible for administering the travel to—and commodities that came from—the Indies, and the rutter's ultimate destination.[5]

Perhaps because of this uncomfortable reality, Acosta preempted any skeptical critics among the rutter's readers by assuring them that that this was indeed an accurate representation of what he and the other men aboard the ship had seen. He used the structure of the rutter itself to confer legitimacy. The instructions for drawing up these documents stipulated that they be read out at the end of each day and agreed upon by all crewmembers. This practice gave the (mostly illiterate) sailors an opportunity to validate the day's record, but in this case, it also served as a means for Acosta to provide some legitimacy to his claim. He himself had not drawn it, he conceded, but the person who had was not only an eyewitness, but he had also drawn it in view of everyone aboard ("*a juicio de todos*"), all of whom agreed that it was true to life.[6] In Seville, the personal experience of

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[5] For more on the *Casa de la Contratación,* especially its administrative functions and its role in cosmography, see José Manuel Piernas y Hurtado, *La Casa de la Contratación de las Indias* (Madrid: Victoriano Suárez, 1907); Clarence Henry Harding, *Trade and Navigation Between Spain and the Indies in the Time of the Hapsburgs* (Cambridge, MA: Harvard University Press, 1919), chapter 2; José Pulido Rubio, *El Piloto Mayor de la Casa de la Contratación de Sevilla: Pilotos Mayores, Catedráticos de Cosmografía y Cosmográfos* (Seville: Escuela de Estudios Hispano-Americanos, 1950); Ursula Lamb, "Cosmographers of Seville: Nautical Science and Social Experience," in *First Images of America: The Impact of the New World on the Old,* volume 2, Fredi Chiappelli, ed. (Berkeley: University of California Press, 1976), pp. 675-686; José Cervera Pery, *La Casa de Contratación y el Consejo de Indias: Las Razones de un Superministerio* (Madrid: Ministerio de Defensa, 1997); David C. Goodman, *Power and Penury: Government, Technology, and Science in Philip II's Spain* (Cambridge: Cambridge University Press, 2002), pp. 74-80; Alison Sandman, "Mirroring the World: Sea Charts, Navigation, and Territorial Claims in Sixteenth Century Spain," in *Merchants and Marvels: Commerce, Science, and Art in Early Modern Europe*, Pamela Smith, ed. (New York: Routledge, 2002), pp. 83-108; Antonio Barrera-Osorio, *Experiencing Nature: The Spanish American Empire and the Early Scientific Revolution* (Austin: University of Texas Press, 2006), chapter 2; María Portuondo, "Cosmography at the *Casa, Consejo,* and *Corte* During the Century of Discovery," in *Science in the Spanish and Portuguese Empires, 1500-1800,* Daniela Bleichmar and Paula de Vos, eds. (Stanford: Stanford University Press, 2008), pp. 57-77; Portuondo, *Secret Science*; Edward Collins, "Francisco Faleiro and Scientific Methodology at the Casa de la Contratación in the Sixteenth Century," *Imago Mundi* 65, no. 1 (2013): 25-36.

[6] "Su faction y manera esta q[ue] aq[ui] vera v[uest]ra señoria a juicio de todos e del q[ue] pinto q[ue] vio bien de esta manera," Derrotero del San Lázaro, AGI, Patronato 20, n. 5, r. 7, f. 3^{v}.

the pilots was validated by the formal education of the geographers in Spain who took the information they provided to make maps. A similar process took place aboard these ships, with the personal experience of the sailors and soldiers who saw strange things had their experiences corroborated by the pilot who wrote it down in the official rutter. As Antonio Barrera-Osorio has argued in his work on empiricism in the early Spanish empire, the *Casa* as an institution "provided a space for, and thus validated, personal knowledge as a source of knowledge," even if that personal knowledge came from people who lacked the social credentials for credibility.[7]

After detailing the specifics of the rest of the voyage, ending with the expedition's return in February of 1534, Acosta turned for a second time to the animals that had so captivated his attention. The bottom of the page now had two images of these creatures. The reason for the double image, he explained, was because he felt unease with the earlier drawing. **[Figure 1.3]** The problem, he noted, lay with their lower halves. "The fish that we saw," the caption read, "resembled these, although we were unable to determine whether it had scales or not."[8] Since it was a marine creature, part of the animal was always submerged. As a result, the person who drew it filled in the incomplete evidence with their imagination, which was informed by their cultural understanding of what sea

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[7] Barrera-Osorio, *Experiencing Nature*, p. 37. On credibility, see Simon Schaffer and Steven Shapin, *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, NJ: Princeton University Press, 1985); Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth Century England* (Chicago: University of Chicago Press, 1993). On the importance of eyewitness testimony in matters of the new world, see Andrea Frisch, *The Invention of the Eyewitness: Witnessing and Testimony in Early Modern France* (Chapel Hill: University of North Carolina Press, 2004), especially chapter three for the context of early modern travel; Anthony Pagden, *European Encounters with the New World: From Renaissance to Romanticism* (New Haven: Yale University Press, 1993); Stephen Greenblatt, *Marvelous Possessions: The Wonder of the New World* (Chicago: University of Chicago Press, 1991).

[8] "El peje que bimos semejaba a estos aunq[ue] no debisamos si tenia escama o no," Derrotero del San Lázaro, AGI, Patronato 20, n. 5, r. 7, f. 4^{v}.

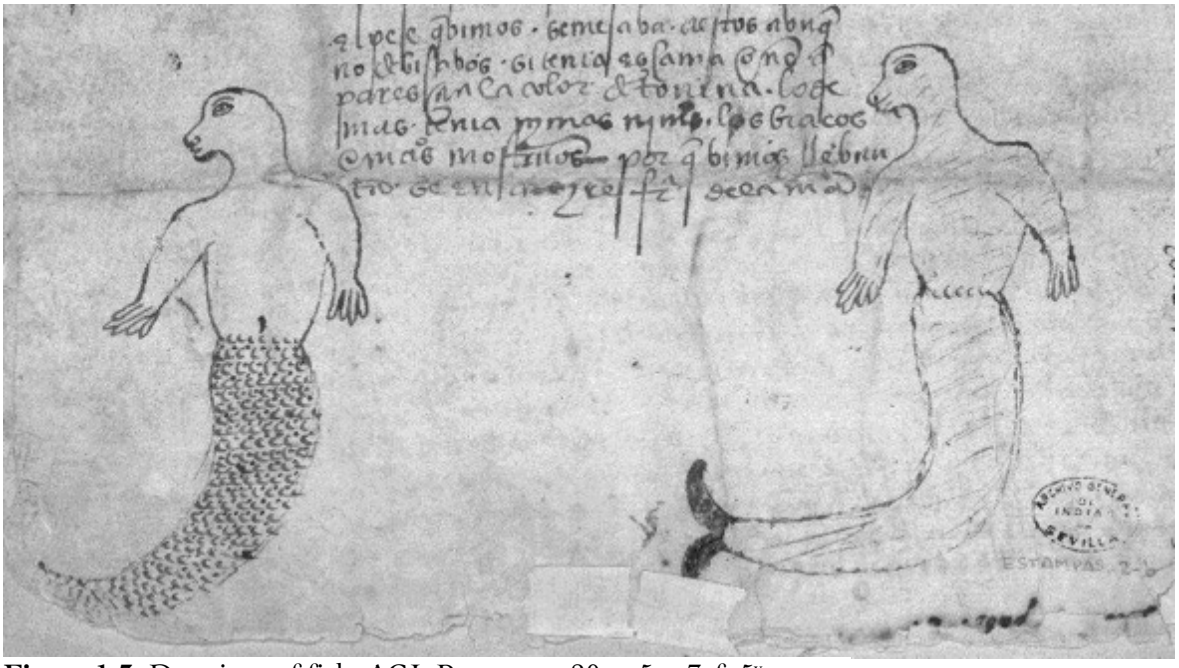

Figure 1.3: Drawings of fish, AGI, Patronato, 20, n.5, r.7, f. 5[v]

monsters looked like. Since its closest European counterpart was always depicted with a scaled tail, those who drew it envisaged it with the same attribute.

Upon further reflection, however, Acosta realized that it was possible that these fish were something altogether different from the sirens of European understanding and that the first drawing might not be correct. He had his uncredited artist draw another pair of figures. Since there was no way of knowing for sure without parting the waves, one was drawn with a smooth tail congruous with the rest of its body, while the other had a scaly tail that was more in line with the late medieval understanding of similar creatures. To give a clearer description, Acosta provided more observed characteristics: they were of a grayish color, and they had "monstrous arms and hands," which he knew because he had seen the animals use them to lift their upper bodies up out of the water and into the air.[9]

[9] "[…] paresçian la color de tonina lo demas tenia ny mas ny m[en]os los braços e ma[n]os mo[n]struos[as] por q[ue] bimos llebantarse en ayre f[ue]ra de la mar," Derrotero del San Lázaro, AGI, Patronato 20, n. 5, r. 7, f. 4[v].

Also, though Acosta did write earlier that some of his sailors thought the animal was a merman (*"hombre marinero"*), the animal was now very clearly described as a fish, not a mythical beast. Moreover, he made it plain that there were many of these animals basking in the waters of the Pacific Ocean. One individual creature, or even a handful of them, could be written off as the result of nature's playful exuberance—an exceptional monster. However, the sea was full of these things. This was another example to be added to the rapidly growing list of new types of ordinary animals that Europeans encountered as they traveled farther and farther away from the lands circumscribed by ancient learning.

The rutter went on to describe more unexpected creatures. Acosta wrote that on one of their first landfalls, the sailors explored the island to get a sense of the land's geography. They were ordered to climb the highest mountain they could find to report what they saw. What they brought back was standard fare for a rutter: that the land was continental, rocky, and mountainous as far as the eye could see, that the earth was moist, and the climate humid. In short, it was everything needed to update the ever-changing world maps in Seville and to determine whether the land would be suitable for further exploration and exploitation. But the rutter also made note of something else—the animals the crew members found. Among them were various fish and

> turtle doves, with plumage similar to those of partridges […] and a beak like that of a pigeon. They also had doves, and they also brought back thrushes, a great amount of them, very plump, which the sailors captured with their bare hands as the birds were drinking. They also said that they saw golden eagles, an infinite number of parrots, and also falcons, and they heard the braying of strange animals that no one was able to identify. They brought some of these animals back dead.[10]

[10] "[…] y ent[r]e ellos tres o quatro tortolas q[ue] tenya[n] el plumaje ny mas ny m[en]os como perdizes y […] el pico tenia de palomas. mas truxero[n] zorzales cantidad dellos muy gordos q[ue] estaban a toma[r] con las ma[n]os mas dezian que abian visto aguilas Reales ynfinitos papagayos e tambien alcones e oyero[n] bramydos de animales q[ue] no supiero[n] q[ue] dezir de q[ue] truxero[n] muertas," Derrotero del San Lázaro, f. 2^{v}.

All of these seemingly extraneous things— the unidentified braying creatures, the strange fish, rattling snakes, and others— appear at first glance not to belong in a document whose purpose was to serve as a record of a ship's course in order to update navigational charts.

In the early sixteenth century, Spanish officials in charge of exploring, protecting, and exploiting the newly discovered territories to the west still had not settled on the exact form for pilots, captains, or sailors to report on their experiences in the unknown, or indeed its specific content.[11] Some matters were set: these documents needed to contain navigational information that had to be confirmed by the sailors. But others were left more up to the discretion of the individual pilots. After all, what constituted geographically important information was not always clear. Beyond any clear hazards for ships, was it necessary to include information about the geography of the land? About the sources for fresh water or food? About the animals of the region? No two rutters were alike. Additionally, as the Spanish began to make more inroads into the mainland and maritime charts became quite good, the *Casa* de-emphasized rutters and instead asked for a *relación de descubrimiento*, or account of discovery, to facilitate maps of the interior of the American continent. Be it a rutter or a *relación*, all Spanish travelers to uncharted territories had to compile a descriptive account of their journey and these documents often contained information that, while not strictly geographical, was nevertheless important for the work of early modern empire.[12]

While Spanish explorers had, since the earliest days of empire, a long tradition of describing and collecting the flora and fauna of the lands they explored, it might seem at

[11] Portuondo, *Secret Science*, p. 100.
[12] On the production of knowledge in the context of the early modern Atlantic, see the essays in James Delbourgo and Nicholas Dew, eds. *Science and Empire in the Atlantic World* (New York and London: Routledge, 2008).

first glance that these observations were of little scientific importance. Since these expeditions were made up almost universally of sailors, pilots, and soldiers with neither scientific nor artistic training, it seems unlikely that they could have made many inroads into serious scholarly study of the natural world. Moreover, it is tempting to assume that the observations the did make had little scholarly or historical importance. It is true that the great age of Spanish imperial scientific expeditions was yet to come, and it was not until the eighteenth century that expeditions routinely employed trained artists for the purposes of depicting nature in a systematic and scholarly way.[13] Nevertheless, these early explorers shared the same interest in the exotic that led their contemporaries to avidly read broadsides announcing monstrous births, to collect curios for their *wunderkammern*, and to eagerly search for the strange and the bizarre.[14] In doing so, these sailors, soldiers, and pilots provided Europe with some of its first glimpses of novel American animals as unvarnished observations.[15] Though their way of knowledge-making was different than the juridical sense of knowledge-making in early law, or the empirical sense of later seventeenth century natural philosophy, the prosaic information gathering they performed was necessary for the early Spanish empire and provides crucial insight into how

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[13] For natural history and exploration in the 18th century, see Daniela Bleichmar, *Visible Empire Botanical Expeditions & Visual Culture in the Hispanic Enlightenment* (Chicago: University of Chicago Press, 2012).

[14] J. H. Parry, "Depicting a New World," in *The Early Illustrated Book: Essays in Honor of Lessing J. Rosenwald,* Sandra Hindman, ed. (Washington, D.C.: Library of Congress, 1982); Lorraine Daston and Katharine Park, *Wonders and the Order of Nature, 1150-1750* (New York: Zone Books, 1998); Paula Findlen, *Possessing Nature: Museums, Collecting, and Scientific Culture in Early Modern Italy* (Berkeley: University of California Press, 1996); Oliver Impey and Arthur MacGregor, eds., *The Origins of Museums: The Cabinet of Curiosities in Sixteenth and Seventeenth-century Europe* (Oxford: Clarendon Press, 1985).

[15] For scientific observation, see the essays in Lorraine Daston and Elizabeth Lunbeck, eds. *Histories of Scientific Observation* (Chicago: University of Chicago Press, 2011).

sixteenth-century Europeans understood the natural world and how American animals unsettled that understanding.[16]

This anecdote about a monstrous fish, then, is particularly revealing. The strange creature the expedition first encountered initially was to the European observers a one-off wonder or monster not only because it did not fit within their understanding of the zoological world, but also because it *did* fit in with the late medieval idea of a chimerical merman. However, as these Spaniards continued sailing, they encountered more of these mysterious mermen. This now became an issue of demarcation—by definition, there cannot be a multitude of monsters, and the sailors were forced to reconsider their earlier assessment, and in doing so, they employed different means of understanding and assessing these animals. This chapter illustrates how the sailors, soldiers, and pilots of the early years of exploration were instrumental in bringing about an epistemological shift in understanding strange autochthonous American animals, first as one-off monsters, and then to reconceiving them as part of the normal order of creation.

The chapter begins by discussing the practices of information-gathering in the first decades of the Spanish conquest. It looks at the institutional, political, and economic rationales the *Casa de la Contratación* had for creating documents like rutters or *relaciónes,* and how the *Casa* adapted these documents to their changing needs in the American continent. These documents, which formed part of the explosion of paperwork in the early modern era, are spaces where Europeans had to grapple with new American creatures. As a result, they shed light on how confused Europeans described and understood animals. In

[16] For the empirical sense of matters of fact, see Peter Dear, *Discipline and Experience: The Mathematical Way in the Scientific Revolution* (Chicago: University of Chicago Press, 1995); and for the juridical underpinning of the modern fact, see Barbara J. Shapiro, *A Culture of Fact: England, 1550-1720* (Ithaca: Cornell University Press, 2000), especially chapter 1.

the *relaciónes*, which were required of Spanish explorers in uncharted lands, travelers were instructed to write about everything from geography to local populations to natural history. The reports these travelers gave not only provided their superiors with their first glimpses of previously unknown animals, but they also helped to normalize what had previously been anomalous.

The chapter then analyzes five individual accounts of discovery written between 1527 and 1598 and discusses how the authors and compilers of each account used different strategies to understand the natural world. In doing so, the chapter traces the shift that took place as these people—not trained as naturalists or natural philosophers, and sometimes lacking in any formal education at all—grappled with both their general sense of the order of the world and the evidence of their senses.[17] The Europeans who traveled to the American continent in the sixteenth century did not have the same social and intellectual standing of those traditionally considered to be knowledge-makers, yet in this context, their thoughts and impressions were centrally important for these documents. In all but a few exceptions, the documents were written by a literate scribe or notary, but the information they contained, along with the conclusions that were posited in them, often came from unlettered (though certainly not ignorant) sources. What we get from these *relaciónes*, then, is a type of intellectual history from below—a reckoning of how non-elite people developed a new understanding of the natural world from the vestiges of their older

[17] For more on the validity of untrained knowledge in the process of knowledge making in the case of the southeast borderlands in North America, see Cameron B. Strang, *Frontiers of Science: Imperialism and Natural Knowledge in the Gulf South Borderlands, 1500-1850* (Chapel Hill: University of North Carolina Press, 2018). On the connection between imperialism and knowledge collection, especially from Amerindian actors, see Neil Safier, "Global Knowledge on the Move: Itineraries, Amerindian Narratives, and Deep Histories of Science," *Isis* 101, no. 1 (2010): 133-145.

shattered assumptions.[18] Through looking these five *relaciónes*, this chapter traces the strategies that these informants used to make sense of the American natural world.

Collecting Knowledge

Why did Acosta draw up a rutter in the first place, especially one that was clearly meant not for his own personal use as a pilot, but aimed at an outside audience? The request for this document came from the *Casa de la Contratación* (House of Trade), an institution founded in 1503 that was responsible for dealing with the day-to-day problems and opportunities of commerce and navigation in Spain's newly acquired territories to the west.[19] Along with the *Consejo de Indias* (Council of Indies), its purpose was to ensure that Spanish lands in the American continent were well governed, and that any riches they might offer were explored and exploited. It also provided a physical space to house the goods and merchandise that either needed to be sent to the Indies or had arrived from there, but overall, as its founding document argued, the *Casa*'s main purpose was concerned with "putting in order the finances and trade of the Indies."[20]

As the clearinghouse for not only trade, but also navigation, it was the standard practice that all pilots (all of whom were both trained and licensed by the *Casa*) compile a rutter. This document traced not only the coordinates of their voyage, but also any

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[18] The phrase "intellectual history from below" is borrowed from Lisa Jardine, "Intellectual History from Below," *History Workshop Journal,* no. 55 (2003): 222-226. For history from below, see E.P. Thompson, *The Making of the English Working Class* (London: Penguin, 1991). I also draw on Pamela Smith's argument about viewing the scientific revolution from the point of view of artisans and makers as an "intellectual revolution from the bottom up," Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago and London: Chicago University Press, 2004), pp. 230-241.

[19] Ernesto Schäfer, *El Consejo Real y Supremo de las Indias: Su historia, organización y labor administrative hasta la terminación de la Casa de Asturias*, vol. 1 (Madrid: Marcial Pons, Historia, 2003).

[20] "Lo que parece que se debve proveer pa[ra] poner en orden el negoçio et contratacion de las yndias," Archivo General de Simancas (AGS), CCA, DIV 6, f. 54[r].

information the pilot deemed important about the trip or the geography of the land. A 1571 law would later require that a notarized copy be made of all rutters from overseas voyages of expansion and that one of these copies either be handed over to the pilot major of the *Casa*, or if the ship did not plan to return to Seville, that it be left with the local governor and forwarded to Seville.[21] Although this law came into effect after Acosta's 1533 trip, it is clear from the many documents still extant in Spanish archives that the unofficial practice since the early sixteenth century was to leave something with the *Casa*.

The *Casa* was, overall, an institution concerned with making the exploration of the American continent as profitable as possible. Starting as early as 1508, when it appointed Sancho de Matienzo as its first treasurer, all ships traveling back from the Indies were required to have their cargo inspected and registered in official account books.[22] An official overseer did this to ensure that no ship "carrie[d] with it merchandise, silver, gold, gold objects, or anything else [not in the manifest], or any person traveling without a license, under penalty of losing their entire cargo and being punished with all possible rigor."[23] At times, that rigorous punishment translated into good tidings for Spanish coffers. When two sailors in the crew of the caravel belonging to Diego Alonso Martín de la Gorda were caught trying to smuggle unmarked gold into Spain in 1503, for example, their entire haul was confiscated and included in the *Casa*'s account books as income for that month.[24]

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[21] Portuondo, *Secret Science,* pp. 131-132.
[22] El Doctor Matienço, thesorero del dinero de las Yndias, AGS, CMC, 1EP, 240, f. 2[r].
[23] "Y se les notifique no llevan mercaderias, plata, oro, generos, ni cosas algunas en dicho so pena de perdido y que seran castigados con todo rigor." This was in the manifest of a 1669 ship, but was standard language for all these documents, Auto del navío nombrado Nuestra Señora de los Reyes, AGI, Contratación, 48B.
[24] Account book, AGS, CMC, 1EP 240, f. 2[r].

Despite these procedures to keep unauthorized people from entering (or untaxed gold from leaving) the Indies, the *Casa*'s exact duties were never explicitly delineated.[25] An early document from the first year of its existence set down the vague dictum that its officials were to give the captains and scribes of each ship a set of written instructions with which they had to comply, though these early instructions revolved more around precise notation of amounts and prices of merchandise and gold.[26] However, in short order after the *Casa*'s establishment, its interest spread beyond controlling the flow of goods or taxing imports to the active creation of knowledge. The first step to possessing something, its officials realized, was to understand it, thus to better exploit these new territories, it transformed itself into what Antonio Barrera-Osorio, in his work on empiricism in Spanish America, called "a veritable Chamber of Knowledge, the first of its kind."[27]

However, in order to create and consolidate knowledge, officials in this agency first needed a way of getting reliable intelligence from one part of the globe to another—a difficult proposition in the early days of empire and one that would plague it for years to come. Travel, of course, posed a challenge. It took two to three months for a ship to travel from the *Casa* in Seville to Veracruz, the first mainland American port at which Spanish fleets usually stopped.[28] Reliability of knowledge presented another problem. The people who traveled to the Americas in the early years of empire by and large had neither the

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[25] Schäfer, *El Consejo Real y Supremo de las Indias*, p. 34.
[26] El negoçio et contratacion de las yndias, AGS, CCA, DIV 6, f. 1^{v}.
[27] Barrera-Osorio, *Experiencing Nature,* p. 8.
[28] Antonio García Baquero González, *La Carrera de Indias: Suma de la Contratación y Océano de Negocios* (Seville: Sociedad Estatal, 1992). For the issues surrounding science and distance and science, see David S. Lux and Harold J. Cook, "Closed Circles or Open Networks? Communicating at a Distance During the Scientific Revolution," *History of Science* 36, no. 2 (1998): 179-211.

learning nor the social status that generally conferred legitimacy to knowledge.[29] For this, the *Casa* had to rely on methods that extended beyond the traditional, elite modes of studying nature. For them, knowledge came from a broader, vernacular conceptions of the order of the natural world, as well as traditional maritime methods of collecting information.

The Spanish government experimented with various methods for collecting information from its earliest travelers to the New World. Columbus, for example, was instructed on the eve of his second voyage to bring back detailed descriptions of what he encountered, though the specifics of this dictum were somewhat vague.[30] To comply with that command, he kept a journal—which survives only as a 1530 transcription by Bartolomé de las Casas—of the voyages, which he believed would fulfill this purpose.[31] He imagined that this document was expansive enough, since in it he planned to write about

> everything I might do and see and which might take place on this voyage, very punctually from day to day […]. Also, Lords and Princes, besides describing each night what takes place during the day […] I propose to make a new chart for navigation, on which I will locate all the sea and the lands of the ocean Sea […] and show everything by means of drawing.[32]

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[29] On the issue of legitimacy in early modern science, see Simon Schaffer and Steven Shapin, *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton University Press, 1989); Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago and London: University of Chicago Press, 2011). On the importance of social settings on legitimacy, see Mario Biagioli, *Galileo, Courtier: The Practice of Science in the Culture of Absolutism* (Chicago: University of Chicago Press, 1993); Bruce T. Moran, *Patronage and Institutions: Science, Technology, and Medicine at the European Court, 1500-1700* (Chicago: University of Chicago Press, 1994).

[30] Letter from Columbus to the Spanish kings, c. April/May 1493, reproduced in John Boyd Thatcher, *Christopher Columbus: His Life, His Works, His Remains*, vol. 3. (New York: G. P. Putnam's Sons, 1903), pp. 98-113.

[31] John Boyd Thatcher, *Christopher Columbus: His Life, His Works, His Remains*, vol. 1. (New York: G. P. Putnam's Sons, 1903), p. 512.

[32] Reproduced in Thatcher, *Christopher Columbus*, vol. 1, p. 515.

In his translation of this document, the Columbus scholar John Boyd Thatcher argued that Columbus was driven by a prescient knowledge of the momentousness of his voyage. This somewhat overstated the matter—Columbus would have compiled a document like this for any voyage, as would have any other pilot in his situation.[33] Narratives of travel by sea are some of the earliest genres of geographical writing, dating back to the ancient Greek *periplus*, and medieval Italian sailors always navigated with the aid of a *portolano*, or book of ports, which had written sailing directions from which portolan charts were derived.[34] Any pilot in uncharted waters would have compiled a document like this, and Columbus was no exception. Upon Columbus' return to Spain after his first voyage, he was invited to go to Barcelona, where the court had stopped for the year. When he arrived there in June of 1493, he presented to a huge gathering of people not only his verbal testimony and his navigational record, but also various pieces of gold, feather works, spices, precious stones, and parrots he had amassed in exploring the islands of what he erroneously called the Indies.[35] Columbus's later voyages engendered new written descriptions, including ones that focused more specifically on the natural world.

Diego Alvarez Chanca, a physician on Columbus's second voyage to the West Indies, wrote a letter addressed to Seville's municipal authorities about his experiences in the American continent. This was the first information written by someone with any

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[33] Thatcher, *Christopher Columbus*, vol. 1, p. 512.
[34] On the *periplus,* see George Kish, *A Source Book in Geography* (Cambridge, MA: Harvard University Press, 1978), pp. 21-28; On portolan charts, see Tony Campbell, "Portolan Charts from the Late Thirteenth Century to 1500," in *The History of Cartography, Volume One: Cartography in Prehistoric, Ancient, and Medieval Europe and the Mediterranean*, J. B. Harley and David Woodward, eds. (Chicago: University of Chicago Press, 1987), pp. 371-463. On the precise terminology and difference between a *portolano* and a portolan chart, see Campbell, "Portolan Charts," pp. 375-380.
[35] Christopher Columbus, *The Diario of Christpher Columbus's First Voyage to America, 1492-1493* (Norman: University of Oklahoma Press, 1989).

training in natural philosophy to reach Spain. Perhaps because medical pedagogy of the age focused on botany (in the form of *materia medica*) almost to the exclusion of other parts of natural history, or perhaps because, as his letter explained, the region was generally lacking in quadrupeds, Chanca spent more time on the flora than the fauna of the regions he visited.[36] There were, however, some strange things that, to his mind, merited a mention. He described, for example, a patchwork creature that had the coloring and the pelt of a rabbit, though much smaller, with the hands and feet of a mouse, and the ability to climb trees. Many in the company had eaten them, he continued, and they were delicious. The zoological differences between the Indies and Europe did not end there. The land, Chanca wrote, was also host to strange saurian creatures, though he admitted that Columbus's party encountered few of them, since "the Indians consider them as great a luxury as we do pheasants," and they were eaten on sight. Lizards came in all sizes in that region, he continued, including "an enormous kind of lizard […] as large round as a calf, with a tail as long as a lance" that was nearly impossible to kill. He also described "infinite numbers of a great variety" of birds, many of which "had never before been seen," and singular types of fishes.[37]

Soon, travelers were specifically asked to provide information about the flora and fauna they encountered. Columbus, at the completion of his second voyage, received a letter from the Spanish monarchs with more specific instructions. They had read, they wrote him, the "letters and memorials" sent via courier that kept them appraised of his exploits in what by now was clearly not the famed East Indies, and they wanted him to

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[36] Diego Alvarez Chanca, "Letter of Dr. Chanca on the Second Voyage of Columbus to America," translated and reproduced in Julius E. Olson and Edward Gaylord Bourne, eds. *The Northmen, Columbus, and Cabot, 985-1503* (New York: Charles Scribner's Sons, 1906), pp. 283-313.
[37] Chanca, "Letter," in *The Northmen, Columbus, and Cabot*, pp. 296-297.

keep a few things in mind as he prepared his next voyage. Specifically, they asked him about the "falcons" of the region, requesting that he send over as many of them as possible, as well as all other birds that he found, "because we want to see them all."[38]

Similarly, when the conquistador Hernán Cortés began to equip an expedition from the island of Fernandina to the mainland in 1519, the island's governor Diego Velázquez de Cuéllar gave him a detailed list of all the things he ought to do during his trip.[39] This document, written in the form of a series of instructions, covered a great deal of ground. It ordered, for example, that Cortés forbid dice or card games among his men, as they "tend to result in much scandal and blasphemy to God" by those who play them.[40] On a less practical level for traveling with sailors—though of more administrative use for the Spanish empire—Cuéllar asked him to compile more information about the land and what was in it. In this, Cortés was asked to use the assistance of an Amerindian person to whom the Spanish gave the name Melchior. In this arena, Melchior's knowledge was key—the instruction made it clear that as soon as Cortés arrived at his destination, he was to

> be informed about it from information from the pilots, as well as by information from Melchior, the Indian native to [the island of] Santa Maria de los Remedios, who is traveling with you. You will work to observe and sound all of the ports, entrances, and sources of potable water that you see, in the same manner as was done in the island of Santa Maria de los Remedios.[41]

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[38] "Bimos vras letras e memoriales que [lost, but probably 'you sent'] con Torres y abemos abido mucho plazer de saber de todo lo q por ellas nos escrivistes," Carta de los Reyes Católicos a Colón, AGI, Patronato, 295, n.99, f. 1ᵛ.

[39] Instrucción de Diego Velázquez a Hernán Cortés, Isla Ferandina, 1518-10-23, AGI, Patronato, 15, r.7.

[40] "…de los juegos de dados et naypes suelen resultar en much[o]s escandalos et blasfemy[a]s de Dios," ítem 3 in Instrucción de Diego Velázquez, AGI, Patronato, 15, r.7, f. 2ᵛ.

[41] "…despues q[ue] en bien ora llegueys a la d[ic]ha ysla de Santa Cruz siendo ynformado q[ue] es ella y asi por ynformaçion de los pilotos como por Melchio[r] yndio natural de Santa Maria de los Remedios q[ue] con vos llevays trabajarys de ver e sondar todos los mas puertos e entradas e aguadas q[ue] pudieres por donde fueres asy en la d[ic]ha ysla como en la de Santa Maria de los Rem[edi]os," Instrucción de Diego Velázquez, AGI, Patronato, 15, r.7, f. 3ᵛ.

In this, Cortés relied on actors not typical for scholarly observations. Melchior's testimony, in particular, was notable for its inclusion in the instructions themselves. Though Spaniards must have relied heavily on indigenous knowledge and information, it was rare for Spanish officials to explicitly make this point, and rarer still for the indigenous actor to be named (albeit with the name the Spaniards gave to him).[42] The instructions further instructed Cortés to "work with great diligence and solicitude to inquire about and know the secrets of these islands and lands," including information about the birds and other animals.[43] All of these things were to be "set down in the maps of the pilots, and in the official account [*relación*] of these islands and lands […] so that you make a true and complete *relación* of everything."[44] Moreover, the *relación* had to be sworn before a notary.[45]

Starting in the first half of the sixteenth century, various other travelers received similar orders. In 1533, Charles V ordered the president and judges of the viceregal council that resided in the city of Tenochtitlán to write "a long and detailed account" of the land, including (among other things useful for governance) an account of "what animals and birds live in these lands, and their properties," paying special attention to any

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[42] On the difficulty of accessing indigenous voices in the history of the Spanish conquest of America, see Inga Clendinnen, *Ambivalent Conquests: Maya and Spaniard in Yucatán, 1517-1570* (Cambridge: Cambridge University Press, 2003). On its necessity, see Marcy Norton, "Subaltern Technologies and Early Modernity in the Atlantic World," *Colonial Latin American Review* 26, no. 1 (2017): 18-38.

[43] "Trabajareys con mucha diligença et solicitud de inquerir e saber el secreto de las d[ic]has yslas e tierras […] como de los arboles frutas yerbas abes animals," Instrucción de Diego Velázquez, AGI, Patronato, 15, r.7, f. 5^{r}.

[44] "fereys asentar en las ca[r]tas de los pilotos e a v[uest]ro e[escri]b[an]o en la relacio[n] q[ue] le las d[ic]has yslas e tie[rr]as abeys de f[a]zer]…] por manera q[ue] de todo hagays muy complida e entera relacio[n]," Instrucción de Diego Velázquez, AGI, Patronato, 15, r.7, f. 3^{v}-4^{r}.

[45] "de todo traed entera relacion por ante escribano," Instrucción de Diego Velázquez, AGI, Patronato, 15, r.7, f. 5^{v}.

"oddities" they might come across.[46] Charles ordered that these accounts be signed and sent to the Council of Indies, which was the king's advisory committee on everything touching upon Castile's possessions in the New World. They were to be accompanied, the decree continued, with "drawings done as accurately as possible of all of the things above mentioned of all that can be painted."[47] This desire for information did not abate, and in 1573, Charles' successor, Philip II, issued a blanket order to all the "viceroys, presidents, governors, archbishops, bishops, and prelates of the church both secular and religious, and all other parts of the government" that resided in the Indies to observe and make descriptions of the land in which they lived.[48] The list of requested information was vast, covering more than 60 folios of hand-written notes. Throughout, the assumption was that knowledge would lead to better governance, and, as a result, greater wealth. Part of that essential information was, of course, information about the animals of the region, both the European ones that had entrenched themselves in these new lands, and the indigenous ones that might not yet be known in Europe.[49] Questionnaires like these would, over the

[46] "Por que queremos tener entera noticia de las cosas de essa tierra [...] vos mando, que luego que esta recibays hagays hazer una muy larga y particular relacion de [...] las calidades y extrañesas que en ella hay [...] y que animales y aves se crian en ellas, de que calidades son." Real Cédula, 1533-12-19, in *Provisiones, cedulas, instrucciones de Su Magestad ... para la buena gobernación de [e]sta Nueva España* (Mexico: Pedro Ocharte, 1563), f. 89^{v}.

[47] "Y juntamente con la dicha relacion nos la enviareys pintada lo mas acertadamente que ser pudiere todo lo susodicho, lo que se puede pintar," Real Cédula, 1533-12-19, in *Provisiones,* f. 89^{v}. There is no evidence, however, that it was routine practice to hire a trained artists to accompany sixteenth century expeditions, though the practice would be more common in later eras, see Daniela Bleichmar, *Visible Empire: Botanical Expeditions and Visual Culture in the Eighteenth-Century Hispanic Enlightenment* (Chicago: University of Chicago Press, 2012).

[48] "A los Virreyes, Presidentes, Audencias, Governadores, Arzobispados, obispos, y prelados de las Iglesias seculares y de religion y a todos las otras justicias y personas ecclesiasticas y seculares a quien o de yuso escrito toca o puede tocar en qual quier manera." Real Cédula 1573-07-03, AGI Indiferente 427, L.29, f. 5^{v}.

[49] Real Cédula 1573-07-03, AGI Indiferente 427, L.29, f. 13^{r-v}.

next few years, become codified into what were later called the *relaciones geográficas* and sent out to all Spanish overseas territories until the nineteenth century.[50]

These efforts were somewhat ad hoc, with travelers asked to collect this sort of information from various rulers that ranged from local governors to the Spanish monarchs, but as the *Casa* gained more authority over Spanish travelers to the Indies, its members began to codify a similar process for asking for information from their own pilots. In 1510, there was a clamor of dissenting voices at the *Casa*, with everyone from governmental officials to merchants all protesting to the king about the disjointed way in which the *Casa* regulated trade.[51] As a result, the institution drew up a more complete set of rules and privileges. The new policies explicitly laid out everything from the somewhat scant working hours (from 10-11 in winter mornings, and 9-10 in summer mornings, and then 5-6 in the evening) to the head pilot's ability to give instructions to any expedition leaving for the Indies.[52] The *Casa* also realized its greater need for reliable data about the American continent, and began to formally require that all expeditions bring back descriptions, though the specific format that these accounts were to take was still very much up in the air, and they toyed with several models. One of these was the rutter, like the one for Acosta's voyage discussed above, while others were more narrative in style, like Columbus's journal. Often, especially as the rutter became more exclusively geared to

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[50] A similar question was added in the first iteration of these questions, printed in 1577, "Instruction y memoria, de las relaciones que se han de hazer, para la descripcion de las Indias, que su Magestad manda hazer, para el buen gouierno y ennoblescimiento dellas," Biblioteca Nacional de España (BNE), MSS/3035. On the *relaciones geográficas,* see Francisco de Solano, "Significación y Tipologia de los Cuestionarios de Indias," in *Cuestionarios para la Formación de las Relaciones Geográficas de Indias: Siglos XVI / XIX*, Francisco de Solano and Pilar Ponce, eds. (Madrid: CSIC, 1988); Barbara Mundy, *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geográficas* (Chicago: University of Chicago Press, 1996).
[51] Schäfer, *El Real Consejo,* p. 35.
[52] Schäfer, *El Real Consejo,* pp. 36-37.

the production of maps, expeditions created a version of each of these documents to cover both the cosmographical information that the *Casa* needed to create maps (from the rutter), as well as providing officials back home with a list of potentially commercially exploitable goods (from the *relación*).

The *Casa*, on behalf of the king, increasingly gave explicit orders to their pilots and sailors to create these documents. One such order specified that travelers on all voyages of discovery record their journey in an assiduously up-to-date rutter.[53] These instructions also reinforced the idea that this was a document for navigation and cartography, since voyagers (whether by land or by sea) were asked to note all physical landmarks and information about winds and currents.[54] They were also asked to inform themselves as to the "types and quality of both domesticated and wild animals [...] that there were in the land," and anything else that could be contained under the rubric of description.[55] These were to be included in the narrative, day-to-day account of the trip, and at the end of each day, what had been written was to be "read out loud in public in front of the people who took part in the said discovery, in order to better and more truthfully describe what happened."[56] This was not just an exercise in fact checking, but one of consensus making.

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[53] Provision en que se declara la orden que se ha de tener en las Indias, in *Libro Quarto de Provisiones, cedulas, capitulos, de ordenanzas, instrucciones, y cartas tocantes al buen gobierno de las Indias despachadas en diferentes tiempos por sus Majestades* (Madrid: Imprenta Real, 1596), p. 233.

[54] "que vayan echando sus puntos y mirando muy bien las derrotas, las corrientes, aguages, vientos, crecientes y aguadas q[ue] en ellas huvire," Provision en que se declara la orden que se ha de tener en las Indias, in *Libro Quarto de Provisiones,* p. 233.

[55] "…que se informen de la calidad de animals domesticos y salvages […] que huviese en la tierra," Cédula dirigida al Virret del Peru, in *Libro Quarto de Provisiones*, p. 232.

[56] "Los descubridores por mar o tierra, hagan comentario y memoria por dias, de todo lo que ovieren y hallaren y las aconteciere en las tierras que descubrieren, y todo lo vayan assentando en un libro, y despues de assentado se lea en publico cada dia, delante los que fueren al dicho descubrimiento, porque se averigue mas lo que passare, y pueda constar de la verdad de todo ello," Provision en que se declara la orden que se ha de tener en las Indias, in *Libro Quarto de Provisiones*, p. 234.

As we saw from the possible mermaid described above, the material sailors and pilots encountered needed interpretation, not just mere retelling. Moreover, the *Casa* recognized the judgement of pilots and sailors to create that consensus—meaning that these intellectual exercises took place before these documents reached more formally educated officials in Seville.

From the prevalence of these documents from various political and administrative entities, the importance of these descriptive accounts is clear. Over the course of standardizing travel to the Spanish empire, all of these documents (regardless of their original requestor) ended up at the *Casa*'s main building, the Casa Lonja de Mercaderes in Seville.[57] Though they were useful internal documents for both the *Casa* and the Council of Indies, they were not simply filed away upon receipt in Seville, the paper byproduct of an irksome bureaucratic necessity.[58] Nor did the obvious needs for secrecy keep these documents from circulating. These rutters and *relaciónes* did, of course, contain detailed geographic and cosmographic information that could have allowed foreign interests to encroach upon Spanish territories. Nevertheless, as María Portuondo argued, the fact that these documents contained sensitive information did not mean that they were not used by

[57] As a result of being stored in the *Casa de Contratación*, they all ended up in the same archive when that building became the Archivo General de Indias in 1785, Jorge Cañizares-Esguerra, *How to Write the History of the New World: Histories, Epistemologies, and Identities in the Eighteenth-Century Atlantic World*, (Stanford: Stanford University Press, 2001), pp. 170-203

[58] For a discussion about how archives themselves allowed their users to carry out scientific activity, see Lorraine Daston, "Introduction: Third Nature," in *Science in the Archives: Pasts, Presents, Futures,* Lorraine Daston, ed. (Chicago: University of Chicago Press, 2017), pp. 1-15. On archives in the contexts of Spanish colonialism, see Kathryn Burns, *Into the Archive: Writing and Power in Colonial Peru* (Durham, NC: Duke University Press, 2010). See also Elizabeth Yale, "The History of Archives: The State of the Discipline," *Book History* 18, no. 1 (2015): 332-359.

a variety of actors of the era.[59] Instead, the secrecy that the *Casa* maintained was deliberately and helpfully porous.

Over the course of the sixteenth century, requests flew into Seville to view these documents.[60] Everyone from mapmakers to history writers submitted requests for copies of these documents to be sent to them, since the scribal practices of the *Casa* meant that the information could only circulate in manuscript. Though of central importance to mapmakers, the information contained in them was also fundamental for writing history, a discipline that, as Gianna Pomata and Nancy Siraisi have pointed out, "straddled the distinction between human and natural subjects, embracing accounts of objects in the natural world as well as the record of human action." From the early Renaissance to the eighteenth century," they argued, "nature was fully part of the field of research called *historia*."[61]

For their part, early modern Spanish administrators agreed. A document that appointed Pedro Ambrosio Onderiz to replace Arias de Loyola as the new official chronicler *cronista mayor*) of the Indies (a post created by, and answerable to, the *Casa de Contratación*), shows that "the general, moral, and natural history of the discovery of the Indies" were all requisite parts of true *historia*.[62] Throughout the course of the sixteenth

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[59] Portuondo, *Secret Science*. Though she makes this argument with regards to cosmography in particular, the same conclusions can be drawn for natural history.
[60] See, for example, the documents in AGI, Indiferente 784.
[61] Gianna Pomata and Nancy Siraisi, "Introduction," in *Historia: Empiricism and Erudition in Early Modern Europe*, Gianna Pomata and Nancy Siraisi, eds. (Cambridge, MA: The MIT Press, 2005), pp. 1-2.
[62] "… para que vos ocupes en recopilar y hacer la historia general moral y natural ansi de los hechos y casos memorables que en aquellas partes tuvieren acadeido," Pedro Ambrosio: titulo de cronista mayor de las indias en lugar de Arias de Loyola, San Lorenzo, 1595-09-16, AGI, Indiferente, 874. For more on the use of history in the early modern Spanish state, see Richard L. Kagan, *Clio and the Crown: The Politics of History in Medieval and Early Modern Spain* (Baltimore: The Johns Hopkins University Press, 2009). For the use of history in the service of the Spanish

century and into the first decades of the seventeenth century, little had changed—the language for the appointment for the next few chroniclers of the Indies remained virtually identical.[63] For the purposes of that position, a history of the Indies should, to be sure, include civil history, but also "all other things worthy of knowing, including the properties of their [...] animals."[64] These instructions remained part of the chronicler's mandate well into the seventeenth century, though the letter of appointment always had the requisite warning that the material they consulted was secret, and that they were not to spread it injudiciously. It was only in 1625, after the death of Antonio de Herrera and under the tenure of the chronicler Luis Tribaldos de Toledo that natural history was decoupled from general history in the official accounts.[65]

In order for each official chronicler of the Indies to do his job, the *Casa* provided him with all of the *relaciónes* and other descriptions that pilots and other sailors made. Chroniclers were given all the necessary "histories, accounts, information, memorials, letters, and other books and papers" stored at the *Casa*.[66] One chronicler who was eventually removed from his position for his chronic procrastination even used the lack of

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empire, see chapter 5 of that book. For more on the office of chronicler of the Indies, see Rómulo D. Cabia, *La cronica oficial de las Indias Occidentales: estudio historico y critico acerca de la histografia mayor de Hispano America en los siglos XVI a XVII* (Buenos Aires, 1940); Portuondo, *Secret Science,* pp. 219-296.

[63] There was almost identical language used in all the titles for the naming of that various chroniclers over the years, see the titles for Juan Lopez de Velasco, 1571-10-22; Arias de Loyola, 1590-10-19; Antonio de Herrera, 1596-04-15; Pedro de Valencia, 1607-05-04; Antonio de Herrera again, 1608-07-05. All of the titles for the assignments of this position from the sixteenth to the eighteenth century are in AGI, Indiferente, 874.

[64] "la historia general, moral, y natural asi del descubrimiento de las dichas indias … y demas cosas dignas tde saber de sus natruales propiedades de [… los] animales," Titulo de historiografo y cronista general de Indias para Pedro de Valencia, 1607-05-04, AGI, Indiferente, 874.

[65] Licenciado Luis Tribaldos de Toledo, traslado del titulo de Cronista mayor de las Indias, Madrid, 1625-07-12, AGI Indiferente, 874. For more on Herrera's tenure, see Barrera Ossorio, *Experiencing Nature,* p. 91.

[66] Pedro Ambrosio: titulo de cronista mayor de las indias en lugar de Arias de Loyola, San Lorenzo, 1595-09-16, AGI Indiferente, 874.

these documents to explain why the history he was supposed to write was overdue by a number of years.[67] It is clear, then, that for the purposes of furnishing the official chronicler with information, this material could and did circulate, especially since the *cronista mayor* often did not reside in Seville and could not always consult the documents *in situ*. Furthermore, the fact that these documents remained in manuscript does not suggest that they were any less important than printed material. In early modern Spain, as Fernando Bouza Alvarez argued, works written *ad vivum*, that is, in manuscript, functioned as a complement, or even a competitor to the typeset word.[68] That these papers were not published did not mean that they were not meant to be circulated or used, and as we can see in the case of the official chroniclers, these documents (and copies thereof) did move from person to person and were used for the creation of all kinds of knowledge.

Moreover, the information contained in the *relaciones*, though often created by people with little to no formal education in natural philosophy, medicine, or natural history, were nevertheless seen as important in the metropole. They were documents with intellectual heft, taken seriously by authors and users alike. As a result, examining these papers themselves and the ideas contained in them allows us to understand how early modern Europeans made sense of the natural world, and gives us insight into how New World animals upended previously established European understanding of nature. By looking at the content of these documents, we are able to see the strategies Spaniards used to make sense of the unknown.

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[67] AGI Indiferente, 874.

[68] Fernando J. Bouza Alvarez, *Corre manuscrito: una historia cultural del Siglo de Oro* (Madrid: Marcial Pons, Historia, 2001), pp. 16-17. For manuscript culture outside of the Iberian peninsula, see also Brian Richardson, *Manuscript Culture in Renaissance Italy* (Cambridge: Cambridge University Press, 2009); Yaacob Dweck, *The Scandal of Kabbalah: Leon Modena, Jewish Mysticism, Early Modern Venice* (Princeton: Princeton University Press, 2011).

Strategies of Describing

In these early descriptive documents, travelers had to find a way to comply with the request for information about New World animals. While instructions for compiling a rutter or a *relación* might have seemed simple for people in Spain, those who completed these documents often found that not to be the case. As Spaniards ventured further from their own lands, they were faced with a conundrum: how do you describe an animal for which you have no words? In these *relaciónes,* pilots and sailors attempted to explain these novelties by appealing to things they already knew. The historian of science G.E.R. Lloyd argued that the study of nature often begins with analogies like these.[69] In their book about early modern animals, Miguel de Asúa and Roger French also described the inadvertent process of creating what they called 'jigsaw animals' when describing the unknown.[70] Similarly, Anthony Pagden noted that in the early years of conquest, Europeans appealed to the familiar, attaching it to the unfamiliar in order to begin to comprehend novelties. He called this the "principle of attachment."[71] With this process, he argued, "the stark incommensurability of the two is, or seems to be, dissolved in the supposed common recognition" of the thing it is compared to. As a result, they argued, "what follows from an act of attachment is one of recognition."[72] He further argued that the principle of attachment "became an enduring feature of most European efforts to steady the initially vertiginous experience of being in a 'new' world," and though it could

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[69] G.E.R. Lloyd, *Polarity and Analogy: Two Types of Argumentation in Early Greek Thought* (Cambridge: Cambridge University Press, 1966).
[70] Miguel de Asua and Roger French, *A New World of Animals: Early Modern Europeans on the Creatures of Iberian America* (Aldershot: Ashgate, 2005), p. 14.
[71] Anthony Pagden, *European Encounters with the New World: From Renaissance to Romanticism* (New Haven: Yale University Press, 1993), chapter 1.
[72] Pagden, *European Encounters,* p. 21.

not always be applied when faced with the truly and unassailably different, it was still an important feature of American encounters well into the nineteenth century.[73] Though Pagden applied this principle in what he called "proto-anthropology," it was both used (and its effects felt) in other areas where Europeans were faced with the unfamiliar. Animals are a perfect case in point.

In the early accounts written for the *Casa*, travelers again and again used this principle in their descriptions. Examples are legion and are found even in the reports of even the most seasoned of conquistadors. For example, in 1527, the soldier Alvar Núñez Cabeza de Vaca wrote up the account of the Spanish expedition to the Florida peninsula led by Pánfilo de Narváez. As the expedition's second-in-command (and the treasurer in charge of the purse strings), Cabeza de Vaca oversaw the various administrative details of conquest, including writing the account of discovery based on the observations of Narváez and his men. He was clearly well-versed in the uses of these documents. To aid the cartographers, he gave the indigenous names for the various lands they crossed, as well as a description and location of landmarks like rivers and mountains. To aid the chronicler, he gave the historical specifics of the mission. To aid fellow travelers, he (incorrectly) borrowed a Taino word and warned of the dangerous storms unique to that region "which they call *urucan* in these parts."[74] His account was repeated, almost verbatim, in Francisco

[73] Pagden, *European Encounters,* pp. 24-27, quotation from p. 24.
[74] "una muy gra[n]de torme[n]ta q[ue] llaman uraca[m] en q[u]ales partes," Relación de Pánfilo de Navarez de San Lucar, AGI, Patronato 20, n.5, r.3, f. 1r. See also Rolena Adorno and Patrick Charles Pautz, *Alvar Núñez Cabeza de Vaca: His Account, His Life, and the Expedition of Pánfilo de Narváez* (Lincoln, NE: University of Nebraska Press, 1999). His reference to hurricanes (which borrows from the Carib word for the storms) is one of the earliest European references to this uniquely American phenomenon, see Stuart Schwartz, *Sea of Storms: A History of Hurricanes in the Greater Caribbean from Columbus to Katrina* (Princeton: Princeton University Press, 2014), pp. 33-69.

López de Gómara's 1552 *Historia general de las Indias*, showing that these documents were, as argued in the previous section, used by chroniclers.[75]

He also described the natural world, and the great number of things that were *like* those with which he was familiar. Thus, he wrote that "they found palms trees in [that] land, *like* those of Andalucía," and that it was a land full of "walnut trees, laurels, cedar trees, sage, oaks, pine trees, short palm trees *like* in Castile."[76] The same was true for the animals. They found fertile grassland, so there were "birds, such as geese, egrets, herons, partridges, falcons, sparrow hawks, and marlins," but there were also "many animals like deer, rabbits, hares, bears, lions."[77] These animals were not precisely the rabbits and bears which he and other Europeans were familiar—but they were close enough. For want of another, these labels would have to do.

To a modern reader, it is difficult to parse the presence of lions in the swamps of Florida, but for the author of this *relación*, for all practical purposes, the animal he saw *was* a lion. Just like the latter, it was vaguely felid and had dangerous-looking claws and jaws that hinted at the possibility of a taste for human flesh. At any rate, it was probably best not to get too close. If classification and nomenclature is set by early modern standards rather than our own, then Narváez (and everyone else who found lions, tigers, and crocodiles in the New World) was correct. Partially at work in this facile elision was what

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[75] Francisco López de Gómara, *Historia general de las Indias [1552]* (Barcelona: Linkgua Ediciones, 2004), pp. 107-111.

[76] "Hallava[n] por la tierra palmytos co[m]o los de abdaluzia"; ""[es] tierra donde ay nogales laurels cedros salviasençinas pinos robles palmitos baxos co]m]o en castilla, Relación de Pánfilo de Navarez, AGI, Patronato 20, n.5, r.3, f. 1^{r}, 1^{v}, Italics mine.

[77] "tiene buenos pastos p[ar]a ganados y aves c[om]o ansares garçotas garços perdiçes halcones neblis gavilanes esmerjonas," and "Ay muchos animales como venados conejos liebres ossos leones," Relación de Pánfilo de Navarez, AGI, Patronato 20, n.5, r.3, f. 2^{r}.

Pagden called "the interchangeability of types and the consistency of natural forms."[78] But just as important to this interchangeability (and a point of divergence with Pagden's theoretical considerations) were the ways by which people in the early modern period classified animals.

In early modern Europe, to know an animal was to know two things: its exterior form, and its behavior in relation to humanity. In Narváez's case, he saw a large cat that could have easily eaten him. If it might be as dangerous to humans as lions were, and it also looked like what these Spaniards (who had certainly never seen an African lion anyway) imagined a lion to be, then these European invaders did not see the need for bogging themselves down in particulars—there were lions in the swamps of Florida. But, unlike with Pagden's principle of attachment, these animals were not merely interchangeable to the natural thing known as a lion, they were identical. Narváez assumed that the lion that lived in the regions they called Florida was more than just *similar* to the creature that lived in the interiors of the African continent; they were the same creature. In spite of this, the impression that the new could reasonably be categorized by means of analogy was doomed to a relatively short life. For all that the Indies were populated by many relatively unproblematic rabbit-, bear-, and lion-like creatures, there also existed in that continent animals that could not, even with a generous helping of imaginative license, be anything other than completely alien. Some animals were so strange that they seemed to fly in the face of all that was known in the world.

[78] Anthony Pagden, *The Fall of Natural Man: The American Indian and the Origins of Comparative Ethnology* (Cambridge: Cambridge University Press, 1982), p. 11; D. M. Armstrong, *Perception and the Physical World* (New York: Humanities Press, 1961), p. 135.

Narváez himself grasped this point not long after he found his lions. In the same *relación*, he wrote that he saw an animal that "carries its young in a bag that it has in its belly, and the mother carries them there until they can find their own food. If they are outside of the pouch and people are around, the mother picks up her children, puts them into her bag, and flees."[79] As Pagden pointed out, the principle of attraction does not work well in the face of total novelty. And there was little that could be more novel than this—Narváez's first encounter with a marsupial. In this case, he simply described this puzzling creature as best as he could, using the most precise language available to him. Unlike his description of the terrible storms the local inhabitants called *urucanes*, he did not relate the indigenous name for this creature, either because he did not seek it out, or he was unable to understand it. Without a useful European referent or an indigenous name, he simply gave it the best description he could, though a reader unfamiliar with it might have some trouble understanding or conceptualizing it, leaving imagination to fill the holes left by a lack of information.[80] For a contemporaneous reader of this account, the resulting mental image would have been strange indeed, but it nevertheless was Narváez's best attempt at complying with the requirements of the *relación*.

Travelers also recreated animals using other strategies. Some attempted to convey meaning by constructing a collage of descriptions of various creatures, with careful enumerations of the relative lengths and measures of various appendages, a strategy employed by account of Juan Rodriguez de Cabrillo's 1542 voyage up the California

[79] "entre los quales vireo[n] un animal q[ue] tiene los hijos en en una bolsa q[ue] tiene en la barriga hasta q[ue] sabe[n] buscar de comer y si esta[n] fuera y anda ge[n]te la madre recoxe sus hijos en su bolsa y luego huye" Relación de Pánfilo de Navarez, AGI, Patronato 20, n.5, r.3, f. 2^{r}.
[80] See chapter 2 for more on how readers parsed travel accounts.

coast, likely written by Juan Paez.[81] While the overall thrust of the document was not directed at natural history, whenever the author came across something strange, he gamely attempted a description. For example, when the expedition stopped to take up water on a small island seven leagues north of what they called Cabo de la Cruz, they came across "tracks of animals like livestock."[82] No doubt looking to add meat to their newly renewed stores of water, the expedition followed the tracks and found hundreds of animals that "seemed in their appearance and by their gait like Peruvian sheep."[83] This was the name Spaniards had given to the pack animals used by Amerindians in the mountains of Peru, animals which Spanish people encountered quite early on in their conquest of the Americas.[84] Again, the status of these animals as Andean domesticated livestock (not to mention the fact that their shaggy coats were spun into thread to make clothing), made its most convincing European analog the sheep, thus their new name. By 1542, the Peruvian sheep was a well-known animal for Spanish conquistadors and was already integrated into their zoological epistemology.

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[81] While he is now recognized to have been the first European to travel up the California coast, little is known about the voyage, or Cabrillo himself. There were no printed records of this journey until Juan de Herrera used the account quoted below in his *Historia general de los hechos de los Castellanos,* see Harry Kelsey, *Juan Rodríguez Cabrillo* (San Marino: The Huntington Library, 1986). The document itself could not have been (entirely) written by Cabrillo, who died during the expedition. Some historians suggest that the responsibility for completing the document would likely have fallen to Cabrillo's chief pilot (and captain upon Cabillo's death), Bartolomé Ferrelo, but it is also doubtful that he wrote it, since he is always referred to in the third person. For more on the debate over authorship, see W. Michael Mathes, "The Expedition of Juan Rodríguez Cabrillo, 1542-1543: An Historiographical Reexamination," *Southern California Quarterly* 76, no. 3 (1994): 247-253. An early modern copy of this *relación* in the Archivo General de Indias suggests it was written by Juan Paez, see Relación del descubrimiento que hizo Juan Rodríguez, AGI, Patronato, 20, n.5, r.13.

[82] "vieron unas mandas de animales como ganados," Relación del descubrimiento que hizo Juan Rodríguez, AGI, Patronato, 20, n.5, r.13, f. 3^{r}.

[83] "que paresçian en el pareçer y el andar como obejas del Piru," Relación del descubrimiento que hizo Juan Rodríguez, AGI, Patronato, 20, n.5, r.13, f. 3^{r}.

[84] Daniel W. Gade, "Llamas and Alpacas as 'Sheep' in the Colonial Andes: Zoogeography meets Eurocentrism," *Journal of Latin American Geography,* 12, no. 2 (2013): 221-243.

However, the animal that Paez saw on this expedition was once again different from the Peruvian sheep (and the habitat of this semi-domesticated pack animal of Peru did not extend to the California coast), so it was back to the describing board for the author. This time, in an effort to try and paint a fuller picture, he took a different descriptive tack, resorting not only to other familiar animals, but also to something a bit more quantitative to give these new animals more descriptive volume. So, he wrote that its horns were rather small, only the distance between the thumb and the index finger (a *xeme*) in length, and as thick as a little finger. Its tail he similarly described as being "a thick and round thing, a palm in length."[85] Short of sending a specimen, surely this was the most effective way to get his audience to understand the physical reality of this animal.[86] There was no other way of describing this animal that had neither a European name, nor a European, Asian, or African presence.

The problem of accurate description was compounded when, in order to comply with the demand for information about animals, travelers tried to extract that information from native informants through a process of double translation. Besides the usual problems of language differences, those who asked for native testimony often received answers that were incomprehensible for reasons other than the language divide. In 1542, the same year that preparations for Cabrillo's expedition were getting underway, a small, beleaguered group of Spaniards was just returning to Spanish-occupied territories after a

[85] "tienen quernos pequeños de un xeme en luengo y tan gordos como el dedo pulgar y la cola ancha y redonda e de longor de un palmo," Relación del descubrimiento que hizo Juan Rodríguez, AGI, Patronato, 20, n.5, r.13, f. 3[r].
[86] On sending specimens, see chapter 4 of this dissertation.

two-year trek along the Amazon and through the interior of South America.[87] This expedition, led by the conquistador Francisco de Orellana, also included the Dominican friar Gaspar de Carvajal. The latter (possibly because he had the most formal education in the group and could write the best) was responsible for the official account of the expedition, and near the beginning of the document, he gave his bona fides by explaining that "what I will say from here on out will be as an eyewitness."[88] Despite that claim, a good portion of what he wrote was based on information that the Spaniards, with their non-existent grasp of indigenous languages, extracted from whichever Amerindians they claimed they could understand.[89] Unfortunately, these Europeans were less scholars of language than they were practiced in hearing what they wanted to hear.

Orellana claimed to be able to understand one particularly loquacious informant whose name is not recorded in the document, and that person's translated testimony formed a large portion of the *relación*. Carvajal organized it in a question/answer format. Many of the questions were mundane—he asked, for example, for the name of the man's king, and if there was gold and silver in the region, as well as questions about the construction of their houses and what the local animals were like. For the most part, the answers to these questions were roughly commensurable between cultures. Notions of kingship, means of construction, gold and silver— these were all ideas common to both the

[87] On Carvajal, see Jose Torbido Medina, "Fr. Gaspar de Carjaval, cronista de la expedicion de Orellana," *Descubrimiento del río de las Amazonas: según la relación hasta ahora inédita de Fr. Gaspar de Carvajal con otros documentos referentes a Francisco de Orellana y sus compañeros* (Sevilla: 1894), pp. xvi-xxiv.

[88] "lo que de aqui en adelante dijere será como testigo de vista," Carjaval, *Descubrimiento del río de las Amazonas*, p. 5. On reliable witnessing for early modern natural history, see Ogilvie, *Science of Describing*, pp. 252-254.

[89] On the nature of the "conversations" between Spaniards and Amerindian informants, see Scott Cave, "Communication and the Social History of Contact in the Spanish Atlantic, 1341-1602," PhD dissertation (The Pennsylvania State University, 2018), especially chapter 4.

Amerindian and the Spaniard questioning him. Carjaval also asked this indigenous informant questions that were ultra-specific, questions that brought into doubt the former's grasp of Amerindian languages. He asked, for example, "who are the women who assisted your tribe in fighting us […] and are they married?"[90] Here, it was clear that Carvajal's grasp of the language was less than proficient—the indigenous man's response described a group of people suspiciously similar to the Amazonian women of Greek mythology, suggesting that Carvajal injected a lot of his own understanding into the man's response.[91] As a priest, he had at least some formal education, and this is reflected in what he thought the Amerindian said. This encounter with supposed New World Amazonians suggests that even if things like the war-like women were somewhat of a puzzle for Europeans, they nevertheless had classical referents, and Carvajal and Orellana were content to think of them as an American counterpart to the Amazonian women of antiquity. Likewise, these Spaniards had been in the New World long enough to recognize that the "fine woolen cloth" these women were said to be clothed in came from "the many Peruvian sheep in this land," an animal that Carvajal had described earlier in his account.[92]

However, even nearly half a century into the European incursion into the regions, there were still animals that continued to confound. Carvajal recounted how the informant "said that in this land (as far as we were able to understand) there are camels that are used as beasts of burden, and that there are other animals [...] that are the size of a horse, but

[90] "El Capitán le preguntó qué mujeres eran aquellas [que] habían venido a les ayudar y darnos guerra … El capitán le preguntó si estas mujeres eran casadas," Carvajal, *Descubrimiento,* pp. 66-67.
[91] For European conceptions of Amazons in the New World, see Surekha Davies, *Renaissance Ethnography and the Invention of the Human: New Worlds, Maps and Monsters* (Cambridge: Cambridge University Press, 2016), chapter 6.
[92] "andan vestidas de ropa de lana muy fina, porque en esta tierra hay muchas ovejas de las del Perú," Carvajal, *Descubrimiento,* p. 68.

with much longer hair and cloven feet."[93] He wrote down most of the other non-animal responses with a degree of certainty, and with easy, declarative sentences. However, a breakdown in communication became apparent in the animal section. His tone became more ambiguous and more hesitant. The scribe could only give an approximation whose authenticity was not certain, so he wrote that the following was only true "as far as we [meaning his fellow Spaniards] were able to understand." This meant that the animal in question was not at all within the bounds of the comprehensible for the Europeans. Though Carvajal recognized that one of the objectives of accounts like the ones he wrote was to describe the New World in ways that would make the region (and its animals) comprehensible in Spain, he found it difficult to describe an animal he had not seen, and whose description he had not quite grasped. He concluded with the literary version of hands thrown up in despair. These were animals, he wrote, "which we were not able to understand."[94]

Sheer incomprehension was a common response among these early travelers, often because the things they were tasked with reporting sometimes did beggar their belief. In many accounts, especially those that reached the eyes of the reading public in the early sixteenth century, what was described was so beyond the ken of habitual European life that, based on the pages of the reports that made it to press, anything seemed possible. Cabeza de Vaca, mentioned above as a member of the 1527 expedition to Florida, wrote a popular book about his experiences surviving a disastrous shipwreck and a subsequent

[93] "Dijo más, que en esta tierra, según entendimos, hay camellos que los cargan, y dice que hay otros animales […] que son del tamaño de un caballo, y que tienen el pelo de una jeme y la pata hendida," Carvajal, *Descubrimiento,* p. 68.
[94] "…los cuales no supimos entender," Carvajal, *Descubrimiento,* p. 68.

seven-year trek across what is now the southwestern part of North America to Mexico.[95] He and his companions had come back to Spanish territories not only with a narrative worthy of a best seller, but also with stories of seven cities of immense wealth in the northern wilderness. These tales piqued the interest (and cupidity) of Antonio de Mendoza, then the viceroy of Mexico. In 1539, under the pretense of spreading the Christian faith, he launched an expedition, led by the Franciscan friar Marcos de Niza, to find these wealthy cities.

Cabeza de Vaca's account of the region notwithstanding, as far as the *Casa de Contratación* was concerned, this was still undiscovered territory. As a result, like all the travelers mentioned above, Niza wrote (or, more likely, had another member of the expedition write) accounts of his expedition to these fabled seven cities, in which he included information about the animals.[96] Sometimes, he simply incorporated his own understanding to what he saw, as when he described the skins which the Amerindians of the region clothed themselves as cowhides, which they considered as better material for clothes than cotton or wool.[97] Though he had no way of knowing this, these skins did not belong to the cattle with which he was familiar. Rather, they were the skins of the endemic North American bison. Cattle only reached northern New Spain in 1540, traveling with a larger expedition whose purpose was to retrace Niza's steps.[98] However, to a person who

[95] The first edition was printed in 1542, with a second edition following soon after in 1555. Alvar Nuñez Cabeza de Vaca, *La Relacion y comentarios del Governador Alvar Nuñez Cabeza de Vaca, de lo acaescido en las dos jornadas que hizo a las Yndias* (Valladolid: Francisco Fernandez de Cordoba, 1555).
[96] Relación de Marcos de Niça, AGI, Patronato, 20, n. 5, r. 10.
[97] Relaçion de Marcos de Niça, AGI, Patronato, 20, n. 5, r. 10, f. 4r.
[98] Eric Perramond, *Political Ecologies of Cattle Ranching in Northern Mexico: Private Revolutions* (Tucson: University of Arizona Press, 2010), pp. 31-32.

had no knowledge of bison, the two animal products were similar enough to seem identical, even if the animals themselves would prove not to be.

Fray Marcos was not the most reliable of observers—it was, after all, his glowing account of the unfathomable riches of the fabled Seven Cities of Cibola that led to the later launch of a very expensive expedition whose only accomplishment was to expose just how untruthful the friar had been. Whether through jumbled translations between Europeans and Amerindians, or through Niza's own wishful thinking and preconceived ideas of what marvels were hidden just beyond European reach, his zoological accounts were as fantastical as those of the seven nonexistent cities of unimaginable wealth. Whatever the reason, his descriptions recall, much like the sirens in Acosta's rutter, monsters dreamed up in medieval imagination. "The Indians brought me," he wrote,

> a hide one and a half times larger than that of a large cow, and they told me that it was an animal that had only one horn in the middle of its head, and that this horn is curved towards its breast, and that from there, it stuck out in a point. This animal has such force that it is said that there is nothing this horn cannot pierce, no matter how solid it is, if the animal charges at it. They say that there are many of these animals in these lands.[99]

At last, Niza had found the mythological unicorns that Europeans had been pushing farther and farther back into the interiors of unknown lands.[100] He had not only found them, but he found them in herds.

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[99] "Aqui en este valle me truxeron un cuero tanto y medio mayor q[ue] de una gran vaca y me dixeron q[ue] es de un anymal q[ue] tiene solo un cuerno en la frente y q[ue] este cuerno es corvo hazia los pechos y q[ue] de alli sale una puntta d[e]r[ech]a en la q[ua]l dizen q[ue] ti[en]etanta fuerça q[ue] ninguna cosa por rrezia q[ue] sea dexa ronper si tropa con ella. Dizen q[ue] ay muchos animales destos en aquella t[ie]rra," Relaçion de Marcos de Niça, AGI, Patronato, 20, n. 5, r. 10, f. 5^{v}.

[100] Paula Findlen, "Jokes of Nature and Jokes of Knowledge: The Playfulness of Scientific Discourse in Early Modern Europe," *Renaissance Quarterly*, 43, no. 2 (1990): 292-331.

However, when Europeans traveled far north enough to see the actual creatures from which these hides came, they had a different opinion, though greater knowledge did not make these animals any less compelling. These large "cows of Cibola," as they were called (named after the fantastical cities that loomed large in Niza's imagination) were important for later forays north from New Spain. Juan de Oñate, who traveled north from the Mexican city of Santa Barbara in 1598, relied on these animals heavily for food, going so far as to send his second in command, Vicente de Zaldivar Mendoza, with a scouting party to the east in order to "survey and exploit" these animals.[101] Of all of the "rams with enormous horns, native chickens, [...] wild beasts, lions, bears, tigers, little dogs, wolves, ferrets, and porcupines" that lived in this region, the Cibolean cow was by far the most numerous.[102]

Oñate's secretary, Juan Gutierrez Bocanegra, wrote a letter to the viceroy of Mexico, Juan de Velasco, with details of Mendoza's journey, where he sang the praises of this animal. After describing how the expedition saw their first large herd of these animals and detailing their abortive attempts to capture some of the young calves to bring back to New Spain, he attempted to describe them. "Its form and structure," he wrote,

> is so marvelous and comical, but also somewhat frightful, so that the more you look at it, the more you want to look at it. No one could ever be so melancholy that if they saw it a hundred times a day, they could stop from roaring with laughter each time, or stop themselves from marveling at the sight of such a ferocious animal.[103]

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[101] Relacion de Don Juan de Oñate, AGI, México, 24, n. 22A, f. 3^{r}. For Zaldivar's own account of this journey, see AGI, Patronato, 22, r. 4, f. 578^{r}-590^{r}.
[102] Relacion de Don Juan de Oñate, AGI, México, 24, n. 22A, f. 3^{v} and 4^{v}.
[103] "Su forma y estructura es tan maravillosa y comica, o espantosa, que cuando mas se lo ve, mas desea uno verlo, y nadie podria ser tan melancolico que si lo viera cientos de veces al dia pudiera evitar reirse a carcajadas tantas veces, o dejar de maravillarse ante la vision de un animal tan feroz," Relacion de la xornada de las bacas de Zivola, AGI Patronato, 22, r. 13, f. 1031^{r-v}.

After relating this unorthodox treatment for melancholy, he gave a more detailed description. His description went from snout ("the same as our Castilian cows") to tail ("like a pig's, with a few bristles at the end, which is very short and curls up when it runs"), and everything in between. Despite their coloring, the quality of their wool, their horns, the shape of their ribs and backbones, and their curious beards, Bocanegra realized writing was a poor way to describe something so marvelous. He ended his letter by assuring the viceroy that if he were ever to see one, he would realize that "it is much more ferocious than the pen can describe."[104]

Sometimes, even the most thorough of written descriptions could not compete with a picture. As we saw above, Acosta did this with his fishes, and, among the letters and accounts relating to Oñate's exploration of New Mexico, someone did the same for the animal that Bocanegra tried so hard to describe with words. **[Figure 1.4]** This image was included with the other accounts of discovery for the region, though it appears on its own and does not give an indication as to who drew it. Neither do any of the extant accounts mention they were also sending an image.[105] Though the golden age of scientific expeditions in Spanish America was not to come for another few centuries, accompanying the written word with an illustration was a common practice.[106] The level of written

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[104] Relacion de la xornada de las bacas de Zivola, AGI Patronato, 22, r. 13, f. 1031^{r-v}, 1032^{v}.
[105] This section is prefaced with a page with "los papeles que ultimamente se trujeron por mandado del señor presidente del oficio del secretario Juan de Yriana", AGI Patronato, 22, r. 13, f. 1132^{r}.
[106] Antonio Lafuente and Antonio Mazuecos, *Los caballeros del punto fijo: ciencia, política y aventura en la expedición geodésica hispanofrancesa al virreinato del Perú en el siglo XVIII* (Barcelona: Ediciones del Serbal, 1987); Alejandro Díez Torre, Tomás Mallo, Daniel Pachecco Fernández, and Angeles Alonso Flecha, eds., *La Ciencia Española en Ultramar: Actas de las Jornadas* (Madrid: Ateneo de Madrid, 1991); María de los Angeles Calatayud Arinero, *Catálogo crítico de los documentos del Real Gabinete de Historia Natural, 1787-1815* (Madrid: Museo Nacional de Ciencias Naturales, 2000); Daniela Bleichmar, "A Visible and Useful Empire: Visual Culture and Colonial Natural History in the Eighteenth Century Spanish World," in *Science in the Spanish and Portuguese Empires*, pp. 290-310; Daniela Bleichmar, *Visible Empire: Botanical Expeditions and Visual Culture in the Hispanic Enlightenment* (Chicago: The University of Chicago Press, 2012).



Figure1.4: Trasunto de cómo son las vacas de Cibola, AGI Patronato, 22, r. 13, f. 1036[r]

description was at times so deplorable that in 1533 (after a rash of particularly bad descriptions of New Spain), Charles V ordered that all "alongside the said account [the *relación de descubrimiento*], you will send us the most approximate picture of all [...] that can be painted."[107] Many subsequent narratives and letters refer to images that had been enclosed when the authors' account was sent to Seville, images that are now for the most part lost. However, it was unlikely that these expeditions were accompanied by anyone

[107] "Juntamente con la dicha relacion nos lo embiareys pintado lo mas acertadamente que se pudiere de todo lo suso dicho lo que se pudiere pintar," Cédula que manda se envíe relación de la grandeza de la Nueva España, Monzon, 19 December 1533, in *Colección de Documentos Inéditos Relativos al Descubrimiento, Conquista y Organización de las Antiguas Posesiones Españolas de Ultramar: De los Documentos Legislativos,* tomo 10 (Madrid: Impresores de la Real Casa, 1897). This document was also sent to the viceroys of Guatemala and Tierra Firme, see Jesús Bustamante, "El Conocimiento Como Necesidad de Estado: Las Encuestas Oficiales Sobre Nueva España Durante el Reinado de Carlos V," *Revista de Indias*, 60, no. 218 (2000), p. 42.

with advanced artistic skills.[108] Neither did the *Casa* include drawing in the skills one learned in Seville before being certified as a pilot because pilots were not in charge of creating maps. By necessity, then, travelers had to rely most heavily on the written word for their descriptions.

Although these five European expeditions, for the most part, too place in different parts of the American continent, involved different actors, and took place at different times, they nevertheless shared some key characteristics. For one, they all added bulk to Spain's paper empire. Each expedition had at least one person write an account of discovery for the *Casa*, and like all other designated scribes, these people made an inventory of the animals they saw. When governmental officials asked for this information, it was with an eye towards practicality—animals presented both danger (in the case of large carnivores) and possibility (in terms of food or commodities). However straightforward the request to describe the animals might have seemed to officials in the metropole, however, in practice, these explorers had to use a variety of techniques to comply with these requests. Some animals, these narrators found, were close enough to animals already known to them (albeit in a secondhand manner)—this was the case in the description of the lions in Florida. Other animals proved more problematic, and the people

[108] One of the things that made the eighteenth-century expeditions of, for example, Alejandro Malaspina or James Cook, notable in the history of natural history is that the brought along not only naturalists, but trained artists. For scientific illustrations by artists in eighteenth century Spanish botanical expeditions, see Bleichmar, *Visible Empire*, pp. 80-90. For the Cook expedition, see John McAleer and Nigel Rigby, *Captain Cook and the Pacific: Art, Exploration & Empire* (New Haven: Yale University Press, 2017). On eighteenth century botanical illustration, see Kärin Nickelsen, *Draughtsmen, Botanists and Nature: The Construction of Eighteenth-Century Botanical Illustrations* (Dordrecht: Springer, 2006), and on scientific illustration more broadly, see Brian J. Ford, "Scientific Illustration in the Eighteenth Century," in *The Cambridge History of Science, volume 4: Eighteenth Century Science*, Roy Porter, ed. (Cambridge: Cambridge University Press, 2003), pp. 561-583.

writing these accounts employed several strategies of describing to make these creatures intelligible back home: some relied on analogical principles, others on detailed quantitative measurements. Whatever the approach, these reporters all hoped to deconstruct an animal with words and have their readers reconstruct them in their imaginations. Europeans like Carvajal attempted to gain insight from indigenous people, but without a common frame of reference, these attempts were often doomed to failure. Others resorted to images, but varying levels of artistic ability, coupled with the *Casa*'s disinterest in training its pilots in drawing, made this strategy equally unserviceable. The main issue, however, was not that the strategies themselves were flawed, but that the animals these people tried to describe simply did not fit into the established European worldview.

Conclusion

These documents— be they rutters, long narrative accounts, or one-off images— eventually all made their way to Seville where they were copied and disseminated throughout the country to various bureaucrats, historians, and other interested parties. And while they were not kept completely sealed off from public view, they were nevertheless internal documents, meant for the private use of the *Casa* and its officials, the Council of Indies, or people appointed by each institution. From early in their history, both organizations sought to keep information about the American continent under wraps. They took measures, for example, to make sure that only those people with valid licenses could travel to the Spanish colonial holdings, and they forbade the issuance of licenses to foreigners. Cosmographical information in particular was kept closely guarded.[109] It was

[109] Portuondo, *Secret Science*, especially pp. 103-108.

not only cosmography that was a state secret. Any accounts—be they historical, ethnographical, or natural historical— were subject to similar rules about dissemination.[110] The *Casa* and the *Consejo* both were afraid that any foreign incursion would destabilize their political claims or religious hegemony, or allow other nations to exploit the land's natural resources.

Spanish officials feared, especially in the early years of discovery, that any leaked information would weaken their hold on their newfound possessions, and they often were not wrong. In 1599, for example, the English writer, editor, and promoter of England's overseas expansion Richard Hakluyt wrote a letter attempting to persuade Queen Elizabeth I to grant the British East India Company a charter to join the lucrative spice trade. Presenting an argument that ran parallel to Hugo Grotius's *Mare Liberum* (which Hakluyt translated into English in 1609) and the doctrine of use, he argued that there could be no justification for barring Christians from sailing on the open sea, and that in certain regions of the East Indies, "abounding with greate welth and riches, the Portingales and Spaniards have not any castle, forte, blockhouse, or commandment," and therefore no legitimate claim on the land.[111] "We are able to prove [this]," he continued, by consulting "Spanish authors published in Spayne," including Gonzalo Fernandez de Oviedo, whose entire oeuvre ran into publication troubles and was never issued in full until the nineteenth century, and Francisco Lopez de Gomara, whose published work was

[110] This was made explicit, for example, in the letters of appointment for chroniclers of the Indies, see note 64 above.
[111] Richard Hakluyt, Notes of information one the behaulfe of the Merchants entending trade to the Easte Indies, 1599, Huntington Library, Mss El 2360. On the doctrine of the *mare liberum,* see David Armitage, "Introduction," in Hugo Grotius, *The Free Sea,* David Armitage, ed. Indianapolis: Liberty Fund, 2004), pp. xi-xx. On the doctrine of use, see L.C. Green and Olive Patricia Dickason, *The Law of Nations and the New World* (Edmonton, Canada: University of Alberta Press, 1989).

quickly banned (and further publication prohibited).[112] Though this concerned Spain's hold on its eastern possessions, Hakluyt (and others who had an interest in nibbling at the borders of the Spanish empire) actively sought out information about Spanish possessions, and even a historical work could be used as justification to encroach on Spanish territories and destabilize their territorial claims.

Though the Spanish were keen to keep foreign hands off of maps and other items of navigational interest, the same regulations about secrecy governed history as well, be it general, moral, or natural. Clearly, works as seemingly innocuous as Gomara's and Oviedo's histories, sometimes did, even indirectly, cause problems that the Spanish government was trying to avoid. So, the official chroniclers were tasked with writing the natural history of the New World were repeatedly warned to keep the results of their labor a secret. In the contract outlining the duties and responsibilities of an early chronicler of the Indies, Juan López de Velasco was ordered to "keep secret all of the things that have just been ordered from [him]," including his examinations of the "the animals and other natural things worthy of preserving in memory."[113] Authors wishing to publish any accounts in print were subject to intense scrutiny, and early in the sixteenth century, the Council of Indies began to ban books that it thought were detrimental to the protection of the empire.[114] Eventually, the Council required that before printing, all books that dealt with the topic of the New World needed to be examined, and that nothing be

[112] Hakluyt, Notes on behaulfe of Merchants, Huntington Library, Mss El 2360, f.1^{v}-2^{r}. For the publication of these histories, see chapter three of this dissertation.
[113] Juan Lopez de Velasco: Titulo de Cronista y cosmografo mayor de las Indias, Madrid, 22-10-1571; "Pedro Ambrosio: titulo de cronista mayor de las indias en lugar de Arias de Loyola," San Lorenzo, 16-09-1595, AGI, Indiferente, 874. See also note 66.
[114] Portuondo, *Secret Science*, pp. 104-106.

printed without a license issued by that body.[115] In this way, these governing institutions attempted to control the flow of information leaving the country, though admittedly to little success. At the end of the sixteenth century, Philip III realized that the policies of his predecessors were fruitless and rarely enforced, and this position was officially abandoned.[116]

However, not everyone was placed under the same burdens of secrecy as these travelers and chroniclers. In fact, some literate Europeans often knew quite a lot about the happenings in the American continent thanks to the chronicler Pietro Martire d'Anghiera, who often sat in on the *viva relación*, or the accounts given in person which complemented the written accounts of sailors, soldiers, and other travelers to the New World. He included these stories in the letters he wrote to various popes and cardinals throughout the early 1500s. These letters were soon after compiled into some of the first printed works about the New World. Animals, as we shall see in the following chapter, loomed large in these texts, but they had a different valence.

In the sixteenth century, Spanish bureaucrats asked explorers to describe the natural world as best they could. In the manuscript sources we have traced, we have seen how Spaniards tried to do this, and how their attempts were read with great interest in Seville, not necessarily to fill in the gaps in the book of nature, but because the Spanish were desperately searching for commodities. The struggle that travelers had in naming and describing American animals was very real, and their accounts provided officials in Spain their first glimpses of previously unknown American animals. However, for the purposes

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[115] Real Cédula [… de] los libros […] sobre cosas de Indias, 21-09-1556, AGI, Indiferente, 425, L. 23, f. 247^{r}.
[116] José Torre Revello, *El libro, la imprenta y el periodismo en América durante la dominación española* (Mexico City: Universidad Nacional Autónoma de México, 1991).

of the *Casa*, the animals themselves were of little economic importance. As foodstuffs, they were deemed inferior to a European palate that preferred familiar meat and feared that local foods would change their natures.[117] They were also too frail to be sent back to Europe as beasts of burden. Unlike many other natural products, animals were almost impossible to commodify in the normal sense, so later writers sought to cash in on something else.

[117] Rebecca Earle, "'If You Eat Their Food …': Diets and Bodies in Early Colonial Spanish America," *The American Historical Review* 115, no. 3 (2010): 688–713.

CHAPTER 2: ARMCHAIR NATURALISTS AND PRINTED MENAGERIES

Introduction: Pietro Martire and the First News of the New World

In September of 1493, a courier arrived in Granada with a letter for Iñigo López de Mendoza the Count of Tendilla, and Hernando de Talavera, the Archbishop of Granada. "Pay heed," the letter began, "you two who are now elders and very wise; hear of the new discovery."[1] The letter writer's excitement was palpable, his ebullient opening a marked change from the usual staid tone he adopted when writing to these two venerable men. The author, the Italian Pietro Martire d'Anghiera wrote from Barcelona, where Christopher Columbus, recently returned from what many in the Spanish court had thought to be a fool's errand, was in attendance in the Spanish court.[2] Both the count and the archbishop had been vocal supporters of Columbus when he pitched his voyage to the court, and Martire wrote to them thinking that they might be interested in knowing that not only had Columbus been successful in persuading the Spanish monarchs to fund the gambit, but that the voyage had been fruitful. In his letter, he went on to describe the marvelous things Columbus claimed to have encountered there: gold, cotton, spices, scarlet trees, new foodstuffs, and new animals. Martire had, for a long time, followed the exploits of his fellow Italians in Spain, especially those of Columbus, whom he considered a particular friend.[3] He also sent word of Columbus' success abroad, writing to Giovanni Borromeo in Rome in May of 1493 that although many people in the Spanish court

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[1] "Atollite mentem sapientissimi duo senescentes, audite novu[m] inventum," Pietro Martire, *Opus Epistolaru[m] Petri Martyris Anglerii* ([Alcalá de Henares]: 1530), epistle 134, f. 32[r].
[2] For more on Martyr, see Henry R. Wagner, "Peter Martyr and His Works," in *Proceedings of the American Antiquarian Society* 56, no. 2 (1946): 239-250; Theodore Maynard, "Peter Martyr D'Anghiera: Humanist and Historian," in *The Catholic Historical Review* 16, no. 4 (1931): 435-438.
[3] Martire, *Opus Epistolarum,* ep. 74, f. 17[v].

thought that Columbus's proposed plan was plain fantasy, he nevertheless came back, with "many precious things" as evidence of his triumph. "Every day," Martire continued to his interlocutor in Rome, "more and more marvelous things are being reported" from the New World.[4] Through this letter, Martire knew that the triumphant news of his fellow Italian's victories would spread to Rome, and from there, the rest of western Europe.

As we saw in chapter 1, Spanish officials often treated information coming from the American continent as a matter of state secrecy, especially when the bureaucratic machine of empire began in earnest in the sixteenth century (even if these strictures worked less well in practice than they did in theory). However, not everyone was placed under the same burdens of secrecy as the travelers to, or official chroniclers of, the New World. Part of what made many of these restrictions superfluous was that literate Europeans often knew quite a lot about the happenings on the American continent thanks to Martire, who eagerly sought out any information he could get, first from Columbus, then from any other travelers who braved the ocean voyage and brought back news from what he was first to call the New World. Writing letters was a common means of communicating amongst the humanists of the later fifteenth century, especially among those who had a large network of interlocutors, as Martire did.[5] To provide material for these letters, he often sat in on the v*iva relación*, or the accounts given in person to the Council of Indies which complimented the *relaciones de descubrimiento* that were presented to the *Casa de Contratación*. He was well

[4] "…quia fabulosa que dicebat arbitrabantur reddit preciosarum multarum rerum," Martire, *Opus Epistolarum,* ep. 131, f. 31^{v}.
[5] James J. Murphey, *Rhetoric in the Middle Ages: A History of Rhetorical Theory from Saint Augustine to the Renaissance* (Berkley: University of California Press, 1981), pp. 194-268; Gerhard Holk, "The First Anthropologist of America: Petrus Martyr de Angleria (1457–1526) and his Epistolary Reports *De orbe novo decades octo*," in *Communicating Observations in Early Modern Letters (1500-1675): Epistolography and Epistemology in the Age of the Scientific Revolution*, Dirk van Miert, ed. (London: The Warburg Institute, 2013), pp. 9-26.

enough regarded by the Council that he was allowed to actively question returning travelers, but since he actively sought material for his letters, he also often invited travelers back to his own home where they continued the discussion over meals.[6] He included their stories in letters he wrote to various popes and cardinals throughout the early 1500s, but more importantly for the dissemination of information about this region were the books that were published on the basis of these letters.[7] It was from his testimony that many Europeans first heard about the Americas, and their knowledge was in large part shaped by the questions and issues he found interesting.

On first glance, Martire does not seem like an ideal person from whom to learn about the American continent. Though he was later recognized and remunerated for his work as a chronicler of the New World with the title of abbot of the island of Jamaica, he never even set foot on a ship bound for anywhere in the vicinity, much less the island itself.[8] Instead, he was attached to the Spanish court as a tutor to young noblemen, and it was his success as a teacher that earned him an official position as an instructor of the liberal arts.[9] Since his students were all sons of the nobility and in the service of the court as pages, Martire, like his students, followed the royal household as the peripatetic court

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[6] Martire was eventually appointed to the Council of Indies in 1518, two years before he was named the royal chronicler, see J. Benedict Warren, "An Introductory Survey of Secular Writings in the European Tradition on Colonial Middle America, 1503-1818," in *Handbook of Middle American Indians*: *Guide to Ethnohistorical Sources*, vol. 13, part 2, Howard F. Cline and John B. Glass, eds. (Austin: University of Texas Press, 1978), p. 47.

[7] He collected and published 812 of his letters in his *Opus Epistolarum,* published in 1530, with many more letters, as well as personal discussions with travelers, forming the basis of his *Decades de Orbe Novum*, which was published in the same year.

[8] Nombramineto de Pedro Mártir de Anglería, Archivo General de Indias (AGI), Contratación, 5787, n. 1, L. 1, f.32^{v}-33^{r}; Wagner, "Peter Martyr," p. 254.

[9] Maria Concepcion Solana Villamor, *Cargas de la Casa y Corte de los Reyes Católicos* (Valladolid: Sever-Cuesta, 1962), p. 77.

wound its way across Spain.[10] Because of this, he was always present whenever a group of travelers made their report to the king and queen.[11] As he wrote to his friend Giocanni Ruffo da Forli after the latter urged him to visit Venice, he was not permitted to leave the court for any reason. If Forli wanted to see him, Forli would have to come to the Spanish court.[12]

Martire's position at court was instrumental in his ability to get information, but his keen interest in the novelties of the new continent was equally important, as was his extensive network of correspondents, which made him the ideal person to spread the news. He ended many of the letters he wrote at the close of the fifteenth century with the promise that, if there were other events relating to these discoveries, he would be sure to include them in his later missives.[13] Over time, he gained a greater prominence, and his meteoric rise in status—fueled, no doubt, by a corresponding interest in anything relating to the New World—was evident in the change in his correspondents. His first letters were addressed to diplomats and clerics, not exactly low-status individuals, but functionaries none the less. The letters that were later published as the first two books of his *De Orbe Novo Decades*, on the other hand, were addressed to the Vice Chancellor of the Holy Roman Church, Ascanio Sforza, though the latter's fall into disgrace required Martire to find a different interlocutor. Conveniently, another of his correspondents, Ludovico of Aragon, had recently been granted a cardinal's hat by Alexander VI, making him a much more

[10] Jerónimo Münzer, "Relación del viaje," in *Viajes de extranjeros por España y Portugal: desde los tiempos más remotos hasta comienzos del siglo XX,* volume 1, José García Mercadal, ed. (Valladolid: Consejería de Educación y Cultura, 1999), p. 382.
[11] Martire, *Opus Epistolarum*, ep. 12, f. 3^{v}.
[12] Martire, *Opus Epistolarum*, ep. 137, f. 32^{v}-33^{r}.
[13] Letter to Ascanio Sforza, ep. 135, Martire, *Opus Epistolarum,* f. 32^{r-v}.

desirable recipient.[14] Martire continued to climb the ladder of religious hierarchy. From lower-level patrons, he was soon addressing popes, and it was these letters—addressed for the most part to Leo X, Adrian VI, and Clement VIII—which made up the bulk of his published works.

From the beginning, Martire wrote his letters with an eye towards a much larger audience. All of his other correspondence after he arrived in Spain was also published posthumously, but from a manuscript that he had prepared only near the end of his life.[15] He had, however, grander plans for these letters about the New World. Letters like these, though addressed to a specific person, were often recopied and circulated through circles of learned people, making them more public than the salutation at its opening might suggest. In that era, a private letter, as Paul Kristeller argued,

> was not merely a vehicle of personal communication; it was intended from the beginning as a literary composition to be copied and read. […] The letter served some of the functions of the newspaper at a time when there was no press and when communication was slow and uncertain [and] was a favored substitute for a short treatise of scholarly or literary or philosophical content.[16]

Martire's letters, in other words, were public news.

A year after Columbus's first trip, Martire wrote to Giovanni Borromeo, telling him that that he had begun to compose a book about these new discoveries. "If I should live long enough," he continued, this project would make it through the press. As soon as

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[14] The third book of the first decade was written to the newly elected cardinal Ludovico of Aragon, rather than Sforza, Pietro Martire d'Anghiera, *De Orbe Novo Decades* (Alcala de Henares: Arnaldus Guillelmus, 1516), f. b1^{v}. On the role of Italians in disseminating information and writing about the American continent, see Elizabeth Horodowich, *The Venetian Discovery of America: Geographic Imagination in the Age of Encounters* (Cambridge: Cambridge University Press, 2018).

[15] This was the *Opus Epistolarum,* with letters spanning his entire life in Spain.

[16] Paul Oskar Kristeller, "Humanist Learning in the Italian Renaissance," in *Renaissance Thought and the Arts: Collected Essays* (Princeton: Princeton University Press, 1990), pp. 8-9. On the use of the epistolary genre in the American conquest in particular, see Javier Malagón-Barceló, "The Role of the *Letrado* in the Colonization of America," *The Americas* 18, no. 1 (1961): 1-17.

it was completed, he promised Borromeo a copy, adding that "it will be of use, at the very least, for learned men who are preparing to write about important subjects, for the books will offer a great and new sea of material."[17] Martire did live long enough to see at least some of his words printed, though much to his manufactured chagrin, his letters were plagiarized and printed in various other sources before he could publish them himself. The letters of the second *Decade* were full of Martire's complaints that the first *Decade* was printed without his authorization.[18] He also claimed that he was especially upset that it had reached the ears of "certain Latinists who live on the Adriatic and Ligurian coasts" who charged him with playing fast and loose with the Latin language, and who attributed the liberal smattering of vernacular words sprinkled throughout his prose as a sign of his ignorance.[19]

Despite the bluster of these protestations, it was clear that he was pleased that his narrative had proven so popular as to be both plagiarized and criticized. He even wore these reproaches as a badge of pride, proudly asserting that if his Latin differed from that of the humanists on the Italian peninsula, it was because he spent a long time in Spain and was becoming more like a Spaniard. Thus, he planned to write as they spoke in Spain.[20] These Latinists so keen on finding fault in Martire's work did not exactly have to search diligently to find these unofficial editions. Starting in 1504, portions of the first ten letters appeared in an Italian translation, and the text contained in that version was published

[17] Martire, *Opus Epistolarum,* ep. 142, f. 34^{r}.
[18] "uti prima[m] decadem vidimus nobis inconsultis impressorum prelis subpositam," Martire, *De orbe novo* (1516), f. e6^{v}.
[19] "Ascripturi ne sint ignorantiae: an incuriae plaeraq[ue] similia latinissimi viri qui adrianum incolunt aut lygusticum," Martire, *De orbe novo* (1516), f. e6^{v}. His argument for this was that he was born in Milan, thus a Lombard, not a Latin, and that he lived in Spain.
[20] "vulgare appellatione hispana," Martire, *De orbe novo* (1516), f. e6^{v}.

four more times in printing houses in Vicenza, Milan, Basel, and Paris in the next decade. The entire first decade was published in Martire's original Latin in 1511, and that too was translated into various vernaculars. It was not until 1516 that Martire published an official edition of the first three decades in Alcala de Henares under the guidance of the Spanish humanist Antonio de Nebrija.[21] In its final form, the work consisted of eight so-called *Decades*, which in turn were comprised of ten books, each recounting the history of early Spanish exploits in the New World using observations from people who experienced it, even though Martire was only an armchair spectator. These books, available to scholars in both the universal language of European scholarship and several European vernaculars, were some of the only early sixteenth century sources of information about the New World accessible to a public outside of the Iberian peninsula, even if it was only open to the literate public.

Much like the authors who compiled the reports discussed in chapter 1, authors of travel books like Martire's, and others who followed him in publishing about the New World, took special delight in describing the monstrous animals of the American continent. This chapter will first look at the way that Martire converted the verbal accounts of conquistadors and sailors into a form that he thought most suitable for both a learned and lay audience, especially how he dealt with the problem of describing a previously unknown animal to an audience wholly unfamiliar to it, and whose learned traditions made even the existence of these animals highly problematic. The chapter then

[21] For the publication history of these books, see Francis Augustus MacNutt, "Editions of Peter Martyr's Works," in Pietro Martire d'Anghiera, *De Orbe Novo, The Eight Decades of Peter Martyr D'Anghiera*, Francis Augustus MacNutt, tr. (New York: G.P. Putnam's Sons, 1912), pp. 49-52; Edmundo O'Gorman, "Pedro Martire y el proceso de América," in *Cuatro Historiadores de Indias, Siglo XVI: Pedro Martír de Anglería, Gonzalo Fernández de Oviedo y Valdés, Bartolomé de las Casas, Joseph de Acosta* (México: Secretaría de Educación Pública, 1972), pp. 36-37.

turns to the genre of travel literature more generally and explores how accounts of the New World not brought these issues to a broader reading public. At the same time, travel accounts (especially those written from the start in the author's vernacular) were immensely popular, and showed that there was both an interest in, and a need for, a more systematic study of the animals of the world because of the contradictions the reading public often found in different books describing the same animals. The chapter ends with a discussion of how travel books ended up being a useful tool for the promulgation of zoological knowledge and were treated as a serious source of information by its authors and its readers alike. These sources reveal new habits of observation and reflection and trace a history where the open-ended inquiry of the manuscript documents compiled by Spanish travelers for the *Casa* morphed into a new kind of curiosity, wherein the books themselves became a sort of textual cabinet of curiosity, from which its readers acquired knowledge about the natural world.

New Animals for a New World

Where did Martire get the information that he so eloquently related to literate Europeans? His position at court meant that he was always at hand when travelers visited the monarchs, and the favor he had garnered with them clearly translated into the privilege of being present at the debriefing. He wanted to make his status as an eyewitness extremely clear to his readers, so throughout the *De Orbe Novo*, he continuously reminded them that his account was trustworthy because much of what he reported came from things that he himself had seen.[22] A case in point was gold, that intoxicating metal that

[22] On the importance of eyewitness testimony, see Antony Pagden, *European Encounters with the New World: From Renaissance to Romanticism* (New Haven: Yale University Press, 1993), pp. 51-87. On

haunted the imaginations and filled the stories of all early European travelers. In the *Decades*, Martire wrote that some sailors had indicated that "they had seen many [grains of gold], some the size of chickpeas." As Martire related it, the story was based on hearsay, but he assured his potentially skeptical readers that "I myself have seen a shapeless gold glob similar to a river rock" that weighed an astounding nine ounces and had been brought back to Spain.[23] That expedition also forcibly brought a few captured people of the Carib tribe, who were later exhibited at the court in Madrid. Though all of them died not long after their arrival, Martire assured his readers that he and others who had traveled to Madrid had seen them.[24] He was not a passive participant in these sessions, either. When Columbus's second in command traveled to speak to the king and queen when the court was in Medina, Martire recounted that he interrogated the commander, along with "other trustworthy men," assuring his readers that he related exactly what he was told by them.[25] From his retelling of this man's story, readers learned of such great zoological oddities as giant lizards and of forests full of purple-plumed parrots the size of pheasants, and others that were feathered in a riot of grey, purple, red, green, and yellow. The expedition captured seven of these birds to present to the court, and he noted how different their coloring was than any other parrot.[26]

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credit in science, see Simon Schaffer and Steven Shapin, *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, NJ: Princeton University Press, 1985); Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth Century England* (Chicago: University of Chicago Press, 1993). On the humanist tradition, see also Richard W. Serjeantson, 'Testimony and Proof in Early-Modern England," *Studies in History and Philosophy of Science*, 30 no. 2 (1999): 195–236.

[23] "Quorum se vidisse multa ciceris crassitudine plures fatentur. Vidi ego ipse […] rudem fluviali petrae similem globum ponderis unciarum ix," Martire, *De orbe novo* (1516), f. b1^{r}.

[24] Martire, *De orbe novo* (1516), f. a5^{v}.

[25] "fide dignis hominibus," Martire, *De orbe novo* (1516), f. a3^{v}.

[26] Martire, *De orbe novo* (1516), f. a5^{r-v}. Most species of African parrots are brown or grey.

Soon after Columbus's voyages, the volume of travelers to the New World increased exponentially. It was no longer feasible—nor was it wise—for all travelers to present their findings directly to the king. The *Casa*, which as we saw in the last chapter governed the commercial travel to the New World, was founded in 1503 and based in Seville, but the king decided he also needed an organization for dealing with the administration of the Indies, not just the trade. He also wanted an organization that would advise him directly. So, in the early decades of the sixteenth century, a new organization—the Council of Indies—coalesced as an offshoot of the Council of Castile in order to help govern Spain's new possessions.[27] Both governmental organizations were heavily invested in knowing what lay beyond the Ocean Sea, but the *Casa* focused on licensing ships and travelers, gathering information, making maps, and of course finding anything that could make Spain's new (and expensive) overseas empire profitable. The newly formed Council's interest, on the other hand, lay more in the administrative aspects of empire.[28] Also, unlike the *Casa*, the Council of Indies was never based in any physical place; instead, it followed the court wherever it went. There, generally every Saturday morning, the president of the Council apprised the king of the issues of the week, and the king would in turn tell the president how he ought to proceed.[29] Overall, the Council of Indies served a different need than the *Casa*, though they both dealt with the same lands.

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[27] The classic work on the Council of Indies, as well as the House of Trade, is Ernesto Schäfer, *El Consejo Real y Supremo de las Indias: Su historia, organización, y labor administrativo hasta la terminatión de la Casa de Austria*, 2 vols. (Seville: M. Carmona, 1935). On how the Council of the Indies worked with the Spanish government, see Stafford Poole, *Juan de Ovando: Governing the Spanish Empire in the Reign of Phillip II* (Norman: University of Oklahoma Press, 2004), pp. 116-137; on Juan de Ovando's tenure in the Council of Indies, see Antonio Barrera-Osorio, *Experiencing Nature: The Spanish American Empire and the Early Scientific Revolution* (Austin: University of Texas Press, 2006), pp. 91-94.

[28] For the similar gathering of cosmographical information in this context, see Portuondo, *Secret Science*, pp. 60-66.

[29] Schäfer, *El Consejo Real*.

In the years when Martire was active, the bureaucratic behemoth that would soon assure that the Spanish Indies were running, if not smoothly, at least in a well-documented manner, had not yet been firmly established. Instead, information, news, complaints, and questions were often voiced in person to this still makeshift council. Those who arrived back in Spain were asked to give a report to the people who made up the council. This *viva relación*, which complimented the written accounts discussed in the previous chapter, was a tradition that continued well into the seventeenth century.[30] These verbal accounts had their inception in the early years of conquest, and they were heard at the Council of Indies.[31] Because of his connection with Columbus, Martire had shown an early interest in matters of the New World and was often present in these council meetings. He also had contacts with Spain's rich and powerful, which he used to learn more about the exceptional American products that ended up in the hands of the wealthy. These connections no doubt opened doors for Martire, and it was likely due to their influence that he was named the first official chronicler of the Indies in addition to his position as a tutor to young noblemen.[32] As the official chronicler, he was not only allowed to sit in on these verbal testimonials—his position necessitated it.

Repeatedly in *De orbe novo*, Martire was adamant that although it was difficult for him to explain what populated this New World, he repeated only what he had heard from eyewitness sources, and it was because of this that his narrative was reliable. Europeans, as Anthony Pagden has pointed out, "have for long been preoccupied with the difficulties

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[30] For an example from 1669, see Manifesto hecho por Juan Alonso de Vera, AGI, Contratación, 48B, f. 11r.

[31] In later years, as the king relied more and more on written reports from people in Seville, these *vivas relaciones* were often heard at the *Casa*.

[32] Kathleen Ann Myers, *Fernandez De Oviedo's Chronicle of America: A New History for a New World* (Austin: University of Texas Press, 2008), p. 18.

involved in encountering other worlds and their fiercely 'other' inhabitants."[33] Martire was well aware of these difficulties, especially for someone who had never actually seen these wonders in their natural environments. Autopsia, that is, the appeal to the authority of the eyewitness, was a huge concern for early modern Europeans, especially those who discussed the New World.[34] Although he could not profess this experience himself, he nevertheless appealed to it when he wrote his letters. "Without exception," he wrote, his account was written from the information from people who recently returned from those regions. Even before he began work on *De Orbe Novo,* he made it clear that his information came from what the sailors reported to him, with none of his own embellishments.[35] After all, as he counseled the pope in one of his letters that became a part of *De Orbe Novo*, "one must always believe those who have actually participated in the events."[36]

Throughout his book, Martire stressed that his information came directly from the people themselves, sometimes in written replies to his letters, but more often than not, by verbal report.[37] He did not always receive good material from this. For example, in one letter, he complained that he had delayed because "in our royal Council of Indies there were read letters pregnant with ambiguities from inept people whose letters arrived every day, from which I was able to gather little of value."[38] He found it more useful to have

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[33] Pagden, *European Encounters*, p. 2.
[34] Pagden, *European Encounters*, pp. 51-87.
[35] Martire, *Opus Epistolarum*, ep.145, f.38^{r}.
[36] Martire, *De Orbe Novo* (1516), f. f4^{r}.
[37] He makes several references to these verbal reports, for example, "Haec ego B[eatissime] Pater ex Vaschi Nunez & commilitonum eius literis & *viva voce* de rebus illis habeo," f. v1^{r}; "Haec & litterae darienensium & *vivae venientium voces* retullerunt," *De Orbe Novo* (1516), f. v1^{r}, f8^{r}, emphasis mine.
[38] "In nostro rerum Indicarum Regio senatu gravidae ambagibus epistolae ab ineptis quibus missae quotidie legebantur, e quibus succi parum colligebam," Pietro Martire d'Anghiera, *De orbe novo... decades* (Alcala de Henares: Nichaele[m] d[e] Eguia, 1530), f. lxvi^{v}.

verbal reports, as in the case of the pilot Andreas Morales, from whom Martire collected information for much of the seventh book of his third *decade*. This man, the text read, "came to visit me, as those who had returned from the ocean are accustomed to doing."[39] He also played host to a revolving cast of explorers, and he boasted that he entertained no less than the illustrious Hernán Cortes at his table, all the while hounding him for information to include in the *De Orbe Novo*.

In person reports allowed Martire to clarify information for his written record. It permitted him to ask specific questions about what he, and not his informant, found most interesting, and it also removed some of the ambiguities that so plagued the letters he received. His writings attest to the fact that he was neither a passive listener nor an uncritical repeater of information. He was never hesitant to label some stories as fictions of a collective imagination, as in the case of the descriptions of women that seemed to bear more than a passing resemblance to the Amazonians of ancient mythology. Though several different people reported it to him, and although he wrote down the stories for the reader to be the ultimate arbiter, he nevertheless gave his own final assessment: these stories were all fables. Martire's emphasis on veracity was not uncommon, neither was the association of travel literature with deceitfulness.[40] As Mary Baine Campbell has shown in the context of seventeenth century travel writing about the American continent, there was an intersection between "the techniques of ethnography," which she equated with observational fact-finding, and "realistic fiction."[41] Campbell described the techniques for

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[39] "Is ad me venit uti solent alii ab oceano redeuntes," Martire, *De Orbe Novo* (1516), f. g8[r].
[40] Percy G. Adams, *Travelers and Travel Liars, 1660-1800* (Berkeley and Los Angeles: University of California Press, 1962).
[41] Mary Baine Campbell, *Wonder and Science: Imagining Worlds in Early Modern Europe* (Ithaca and London: Cornell University Press, 1999), p. 17.

the gathering and dissemination of knowledge as "a culture's temporarily unregulated free play" before it was "codified and regulated as an institution—a science, an academic discipline, a genre."[42] Though these methods do not look recognizable as a scientific means of information-gathering, Campbell shows that they nevertheless provided a means to gather facts in the seventeenth century. The same was true in the late fifteenth and early sixteenth centuries when Martire was active. He and others who created similar works were not intentionally trying to deceive, and they represented to their readers an attempt at describing the natural order of the New World within the norms of observation and recording under which they worked.[43]

Martire also had another objective in mind when he invited these explorers to tell him their stories. He actively interrogated his informants and was especially keen to find where they might be in contradiction with the "ancient philosophers, poets, and cosmographers."[44] He did find that to be the case when sailors told him that the Torrid Zone was not an arid and uninhabitable wasteland as some ancient philosophers thought, but an inhabited region.[45] Points of contradiction like that did cause some consternation for fifteenth century scholars, so lest his readers assume that he simply repeated every ridiculous thing he was ever told, Martire constantly assured his reader that he did his due diligence to make sure that what he related in his letters was what he believed to be true. For example, when one person reported that there was a region in the ocean that he

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[42] Campbell, *Wonder and Science*, pp. 66-67.
[43] Lorraine Daston, "The Moral Economy of Science," *Osiris* 10, no. 1 (1995): 2-24.
[44] "prisci tam philosophi quam poetae & cosmographi," Martire, *De Orbe Novo*, (1516), f. c5^{r-v}. See also Anthony Grafton, *New Worlds: Ancient Texts: The Power of Tradition and the Shock of Discovery* (Cambridge, MA: The Belknap Press of Harvard University Press, 1992).
[45] Nicolás Wey Gomez, *The Tropics of Empire: Why Columbus Sailed South to the Indies* (Cambridge, MA: The MIT Press, 2008).

passed that had a large amount of fresh water in it, Martire called up all the other men in the expedition to corroborate the original person's story.[46] After assuring himself that all the men were trustworthy, he related the account of the freshwater ocean in *De Orbe Novo* because he was sure that what they were reporting as a collective was in fact true, and not the exaggerations of one person. In this, Martire did not adjudicate trustworthiness and credibility by social standing, but in terms of eye witnessing and autopsia. It was not that he did not infer credibility from a person's status—he did, otherwise he would not have chosen to write to the pope. Rather, his assignment of credibility was based on need. In the early years of Spanish exploration, there were not many high-ranking people who chose to make the perilous voyage. In the absence of social markers for credibility, Martire had to act as an arbiter—he heard reports, questioned their bearers, and he made judgments about the reliability of certain people as reputable informants, despite their comparatively low status.[47]

Still, despite his position as an adjudicator, much of what Martire wrote seemed fantastical for the era. His prose, like so many who wrote in the early years of the discovery, was positively purple with images of an imagined paradise. "Some people say," he wrote the pope in 1493, "that of all the lands the stars revolve around, there is no land more fertile."[48] In a later letter, he marveled that all the foreign foodstuffs that the Spaniards sowed or planted grew incredibly well. "Is this not, Most Holy Father," he

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[46] Martire, *De orbe novo*, (1516), f. c1^{v}.
[47] On social standing, credibility, and autopsia, see note 22.
[48] "Terram aiunt esse terraru[m] omnium quas ambiunt sidera uberrimam," Martire, *De orbe novo* (1516), f. a4r. Many other authors and explorers also noted this point. See, for example, Fray Toribio de Benavente, *Historia de los indios de la Nueva España,* Mercedes Serna Arnaiz and Bernat Castany Prado, eds. (Madrid: Real Academia Española, 2014), who spoke in glowing terms about the fertility of Mexico (p. 187) and New Spain (pp. 206, 254-258).

continued, "worthy of the highest admiration?"[49] However, while that was itself amazing, Martire went on to describe something even more noteworthy, the new plants and animals found in those regions. He was struck, as many others were, by the strangeness of the place. "In fact," he told the Pope, when Columbus landed in Hispaniola, they

> found no trees in those islands that were known in our lands, except the palm trees and the pines. Even those were very tall and of marvelous hardness and length, and very straight, all because of the fertile soil, and there were many others that yielded unknown fruits.[50]

Describing not only the fertility of the region, but also marveling that the possibility even existed that the region was home new kinds of plants or animals was a trope in the accounts of the American continent, especially in the fifteenth century.

But stranger still than plants were the animals. In the epilogue to the first decade, Martire marveled that "they found even the animals, reptiles, insects, and quadrupeds are dissimilar to ours, there were innumerable kinds [of them] with many different shapes."[51] He wrote about these things with relish, sometimes with too much relish. Often, he rebuked himself when he veered off on these animal tangents, almost as if he was unable to contain himself. "Enough about these foodstuffs," he declared after a long dissertation on the characteristics of iguanas and the delicacy of their meat, "let us turn to other things."[52] Again, after relating a charming story about a manatee that happily ferried

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[49] "Nonne hoc admiratione dignus sanctissime pater?," Martire, *De orbe novo* (1516), f. e7^{v}.
[50] "nullas enim apud eas insulas nostras arbores invenere praeter pinus palmas quae & eas altissimas ac mirae duricei & proceritatis ac rectitudinis propter soli ubertatem: atq[ue] etiam ignotos fructus alias plures procreantes," Martire, *De orbe novo* (1516), f. a4^{r}. This fertility also applied to imported European animals and led to the overabundance of invasive species in the Americas, see Elinor G. K. Melville, *A Plague of Sheep: Environmental Consequences of the Conquest of Mexico* (Cambridge: Cambridge University Press, 1997), chs. 4 and 5; Alfred W. Crobsy, *Ecological Imperialism: The Biological Expansion of Europe: 900-1900* (Cambridge: Cambridge University Press, 2004), pp. 72-109.
[51] "Animalia reptilia insecta quadrupedia etiam a nostris dissimilia reperere multiformia varia inumeraq[ue], Martire, *De orbe novo* (1516), f. d1^{r}.
[52] Martire, *De orbe novo* (1516), f. b8^{r}.

humans across a lake on its back, he chastised himself with a stern "enough of this digression," before begging the pope's pardon and indulgence, writing:

> if in the course of our narrative I repeat some things, and if I sometimes digress from the point, do not be irritated with me, Holy Father. When I hear, or when I see, or when I write about these things, I am carried away by a delight in my soul, as if I am being driven by a kind of Apollonian or Sibylline breath.[53]

Far be it for him to rebuff the commands of Pythia. His narrative, correspondingly, was crammed with mysteries and marvels almost without counting.

It was from Martire's pen that not just the pope, but the reading public in general learned of many of the novelties that lived in lands they were unlikely to ever visit. For example, Europe's first printed description of a marsupial came from him. It was first included in an unauthorized Italian translation of some of his letters in the *Libretto ∂e Tutta la Navigatione ∂e Re ∂e Spagna* (1504), before being printed in the official account in the 1516 edition of the *De Orbe Novo*.[54] Living among the trees of Hispaniola, he wrote, "is a monstrous animal whose muzzle emulated that of a fox, whose tail emulated that of a chimpanzee, whose ears emulated those of a bat, whose hands emulated those of a human, and whose feet emulated those of an ape."[55] This creature was already more than a little uncanny, but stranger still was the surprise that came next. This animal carried its offspring in "an exterior uterus, like a sort of large pouch, wherever it goes."[56] He continued, writing that "it has been verified by experience" that unless they were playing

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[53] "Si res huiuscemodi aliquas in discursu nostrae narrationis repetiero: sique digredior interdum ut haec referam beatissime pater ne mihi succenseas. Fervor animi prae laeticia cum audio cum video cum scribo ista me velut apolloneus & sibilinus quidam spiritus exagitat," Martire, *De orbe novo* (1516), f. h3^{r}.
[54] Pietro Martire d'Anghiera, *Libretto ∂e Tutta la Navigatione ∂e Re ∂e Spagna* (Venice: 1504), f. d3^{r}.
[55] "inter eas arbores mo[n]struosum illud animal vulpino rostro, Cercopithecae cauda, vespertilioneis auribus, manibus humanis, pedibus simiam aemulans," Martire, *De orbe novo* (1530), f. xix^{r}.
[56] "Quod natos iam filios alio gestat, quocunq[ue] proficiscatur, utero exteriore in modu[m] magnae crumenae, repertum est," Martire, *De orbe novo,* (1530), f. xix^{r}.

or nursing, the animal always kept its young in that pouch, which he likened to a money bag.[57] The experience he alluded to was that of Vicente Yáñez Pinzón, who saw it in 1492, and Martire initially suspected him of telling tall tales. However, Pinzón and his companions all assured the chronicler that they had seen this animal (and its curious baby pouch) for themselves, and they even went so far as to capture it and bring it back home with them. Though her young died on the voyage, the mother did live long enough to be shown to the king and queen in Madrid before she too expired. The body of such a peculiar animal was obviously worth saving, and in 1499, Martire himself examined the desiccated corpse. That convinced him that this animal, however incongruous it seemed, was not the figment of anyone's imagination. Moreover, as he reminded the pope, to whom the book was addressed, "you yourself have seen this animal's corpse at the same that time I did. You examined it and marveled at the pouch that nature gave to it."[58] As unimpeachable a witness as the pope could attest to it, leaving his readers with little choice but to believe Martire's account.

As Anthony Pagden argued, the principle of attraction did not work well in the face of a total novelty, and there was little that could be more novel than this, Europe's first encounter with a marsupial.[59] So, Martire simply described this puzzling creature as best he could. Readers unfamiliar with these animals would have had a great deal of trouble conceptualizing them, leaving imagination to fill the holes left by a lack of information. This process is readily apparent in illustrations of these textual descriptions,

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[57] "Experimento esse compertu[m] aiunt, eo semper utero crumenali animal filios secu[m] portare," Martire, *De orbe novo* (1530), f. xix^{r}.
[58] "Id est animal licet mortuum tu ipse mecum vidisti convolvisti, crumenamque illam novum uterum, novum naturae remedium," Martire, *De orbe novo* (1530), f. xix^{r}.
[59] Pagden, *European Encounters*.

where artists had to perform the second part of a double translation from living creature to textual object, then form textual object to a visual approximation of the original. For example, an illustrator for an Ottoman Turkish translation of early American travel accounts rendered this creature as, quite literally, carrying its offspring in a saddlebag attached to its side.[60] **[Figure 2.1, bottom right]** If these were the sorts of strange creatures stalking the fertile plains of the imaginative minds of early modern Europeans, is it any wonder, then, that people wanted to learn more about them?[61] Martire, for his part,



Figure 2.1: Opossum and Sloth (?), Tarih-I Yeni Dünya, c.1600, Newberry Library

[60] Thomas D. Goodrich, *The Ottoman Turks and the New World: A Study of Tarih-I Hind-I Garbi and Sixteenth-Century Ottoman Americana* (Wiesbaden: O. Harrassowitz, 1990).
[61] For more on the European fascination with opossums, see Susan Scott Parish, "The Female Opossum and the Nature of the New World," *The William and Mary Quarterly* 54, no. 3 (1997): 475-514; Louise Rice, "Willamena's Kangaroo," in *Humanism and Creativity in the Renaissance: Essays in Honor of Ronald G. Witt*, Christopher S. Celenza and Kenneth Gouwens, eds. (Leiden: Brill, 2006), pp. 281-398

did not disappoint. The pages of the *De orbe novo* (or any of its many translated versions) contained stories about creature after creature that, for many a reader, could scarcely be believed. The book described, for example, an animal with no mouth, but with an extremely long tongue that it thrust into anthills to slurp up ants, which were its only sustenance.[62] There was another animal that seemed to be an American upgrade to the medieval bonnacon, but instead of projectile caustic feces, this animal expelled wriggling, live snakes. To make itself even less pleasant, it smelled like a fetid cadaver. Martire heard this story from a group of monks who (for reasons that were not revealed in the text) kept one in their home, though they later killed it because it smelled too terrible.[63] Martire's informants about these things that were "not unworthy of being mentioned" were Tomas Ortiz and his fellow Dominican monks who lived in a convent in Chiribichi (modern day Cumaná, Venezuela).[64] These Dominicans, Martire stressed, were "trustworthy men."[65] He even challenged the likely skepticism of his readers, asking them after a particularly strange story about a worm, "And why should I not believe that to be possible, especially when such distinguished men affirm it?"[66] Part of their trustworthiness stemmed from their vocation, but they also used all their senses to experience the New World. Ortiz, Martire told his readers "tasted briefly, but did not eat" a fruit that was said to "cause various strange maladies." It gave him indigestion.[67] The monks also ate crocodile meat,

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[62] Martire, *De Orbe Novo* (1530), f. cx^{r}.
[63] Martire, *De Orbe Novo* (1530), f. cx^{r}.
[64] "Didici […] alia non indigna relatu per fratrem Thomam Hortissium," Martire, *De Orbe Novo* (1530), f. cviii^{v}-cix^{r}.
[65] "probatos viros," Martire, *De Orbe Novo* (1530), f. cix^{r}.
[66] "Cur & illud accidere posse non crediderim? talibus praecipue viris id affirmantibus?," Martire, *De Orbe Novo* (1530), f. cx^{r}.
[67] "Frater Thomas Hortizius gustasse parumper non comedisse;" "varios cadunt morbos ignotos," Martire, *De Orbe Novo* (1530), f. cix^{v}.

which they said, "was similar to a tender ass, but tasted insipid."[68] These monks used their experiences to validate their claims in a way that brings to mind Isaac Newton's self-experimentation with a bodkin in his eye to observe how changing the shape of an oculus distorts an image.[69]

Even if the witnesses were reliable, the animals of the American continent were often incomprehensibly strange. In describing the regions of Veragua and Uraba (in modern-day Panama), Martire related that

> The pastures of this land are home to many monsters besides the tigers, lions, and other animals that I have already written about, or that have been described by eminent ancient authorities. However, there is one animal in particular that this land produces, one which nature set out to show her amazing powers of artifice. Its body is the size of a bull, and it is armed with the trunk of an elephant, but it is not an elephant. It is the color of cattle, but it is not a cow. It has the hooves of a horse, but it is not a horse. It also has the ears of an elephant, but they are smaller and do not protrude and droop so much.[70]

An animal like this defied categorization. It was one of nature's truly spectacular creations and Martire had no better way of conveying information about its characteristics than to create it as a mental pastiche, as we have seen so many other authors do. He described it as part bull, elephant, and horse, even though it was fully neither of these things—indeed, it was nothing like anything he or his readers had ever encountered, either in the flesh or in the text. So, like the sailors we encountered in chapter 1, he explained these

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[68] "Carni asininae molli par esse aiunt, gustum insipidum," Martire, *De Orbe Novo* (1530), f. cx^{r}

[69] For a discussion of a less visceral kind of early modern experiencing, see Peter Dear, *Discipline and Experience: The Mathematical Way in the Scientific Revolution* (Chicago and London: University of Chicago Press, 1995), chapter 5.

[70] "terrae illius horrentes saltus depascunt praeter tigres et leones caeterque nobis iam nota animalia vel saltem ab egregiis anterioribus descripta monstrosa plura. Sed animal unum praecipue procreat in quo natura studuit sese miram artificem ostendere. Id est corpore bovem aequans proboscide armatum est elephantina non elephas, bovino colore non bos equinis ungulis, non equus auriculis etiam elephantinis sed minus patentibus et demissis quae caeterorum tamen animalium patentioribus," Martire, *De Orbe Novo* (1516), f. e6^{r}.

unexplainable things away as monsters. In that category, they made epistemological sense. Fifteenth and sixteenth century scholars believed that nature was both animate and playful, and quite a prolific joker, especially in the outer reaches of the world. Nature thus conceived reserved the edges of the world—shielded, as they were, from prying (European) eyes—for her most playful exercises.[71] However, by definition, monsters were, if not singularities, at least rare. Even Martire, who so reveled in telling stories about things that would seem bizarre to Europeans, realized that creatures like the bull-elephant-cow-horse creature (to use the previous example), were in fact as common to that region of the world as the fox and the cow were to Europe, an epistemological transformation we can see because of the serialized nature of *de Orbe Novo*.

Martire also noted a similar conceptual shift as it took place in the minds of travelers themselves, as it did with Ortiz when he left Chiribichi. That region, as we saw earlier, was home to a great number of strange creatures. One of them was something he described using a strategy of amalgamation—of building up what Miguel de Asúa and Roger French have described as a "jigsaw animal" made up of the appendages of common European beasts stitched together to form a semblance of the novelties that roamed the New World.[72] It was a strategy that, as we saw above, Martire used again and again in his work. This animal, he wrote, was larger than a French dog, with the face, hands, and feet of a human, a thick beard, and a grave and respectable expression. These animals, Ortiz told Martire, uttered unearthly cries day and night. Having never seen or heard anything like them before, Ortiz and his fellow friars believed them to be demons, enraged at the

[71] Paula Findlen, "Jokes of Nature and Jokes of Knowledge: The Playfulness of Scientific Discourse in Early Modern Europe," in *Renaissance Quarterly,* 43, no. 2 (1990): 292-331.
[72] Miguel de Asúa and Roger French, *A New World of Animals: Early Modern Europeans on the Creatures of Iberian America* (Aldershot: Ashgate, 2005), p. 14.

arrival of Christian missionaries and hoping to scare them off with their ghastly howls. Undeterred, these men persevered, and in the seven years they spent in the region, they came to realize that it was no preternatural demon, but a regular animal, called *aranata* by the inhabitants of the region.[73] Certainly, something with its own name was not a monster for the person who named it, thus, from a singularity, it came to be understood as something commonplace.

Understanding that its strangeness warranted admiration and would elicit wonder back at home, Ortiz brought a dead *aranata* with him upon his return to Spain, even though he had grown accustomed to seeing and hearing it in Chiribichi (and in fact, he considered it somewhat of a pest). The wonder back in Spain, however, was not the emotional response to a singular monstrosity, but puzzlement at how, if this were an animal with a place in the grand scheme of creation, it should be dealt with on an epistemological level. In Europe, it raised new sets of questions, as Martire and the other men in the Council of Indies tried to determine where this strange creature fit in into the old zoological framework. "It appears to me," he wrote in the *De Orbe Novo*, "that it belongs to the race of monkeys or apes," but the friars who brought it to the court thought otherwise.[74] He was interested in the way that these discoveries could influence learned notions about the natural world, an interest shared by many members of early expedition parties, though in the end, he realized that questions like these were best suited to scholars trained in other disciplines.

One thing that Martire could never do was bear first-person witness. He saw things, to be sure, and his letters are peppered with descriptions of massive hunks of gold,

[73] Martire, *De Orbe Novo* (1530), f. cx^{v}.
[74] Martire, *De Orbe Novo* (1530), f. cx^{v}.

tiny jewel-toned birds that were said to buzz in mid-air, monstrous creatures that carried their offspring in a bag, fruits that were strange artichoke-pinecone hybrids, and more. However, even he grudgingly admitted that the things he saw for himself were imperfect specimens. The gold, for example, had been melted down into a standard ingot, still of massive size, but not the same as when the Spaniards had first encountered it. While the strange birds had been captured alive, they died on the ship voyage back to Spain, and had been stuffed with fragrant moss. Similarly, while the animal with a bag had been captured alive with its young, they did not remain so for long. All of the offspring died on the voyage, and the mother was very sickly by the time she was brought ashore in Europe. She succumbed not too long after, leaving nothing but an awful stench and a rotten corpse for Pope Alexander VI to examine. The same thing happened to the fruit—though the sailors had promised that it had the most delectable taste imaginable, when Martire and others at court tried it, all they could taste was the sour tang of a months-old rotting pineapple. Martire could not boast of witnessing in the way that others who had braved a pelagic voyage could. Perhaps inspired by the success of his work, or envious of the commercial success that even older works like the writings of Marco Polo and John Mandeville enjoyed, others also ventured into the authorial world with published accounts of their own travels. The public, as it turned out, had an absolute voracity for travel accounts, both real and imagined, to the New World.

Travelers and their Tales

Travel literature, as a category, is expansive. In broad strokes, it can be defined as any prose account for which travel was instrumental for its creation.[75] It encompasses works written by armchair authors whose journeys, quite possibly, extended only as far as the local library, as well as those who based their accounts on travels they had actually undergone, whether or not the information they related was real, greatly exaggerated, or even the product of a fanciful imagination, though anyone who could claim eyewitness status was sure to tout it. This genre was as popular as it was broad. The interest in it is clear from the delight readers found in the tales of John Mandeville, which was already popular in the middle ages, a popularity that only grew with the discovery of the New World and different routes to Asia, even though the additional years also brought with them greater competition with similar accounts.[76] As travelers made more and more incursions into unknown lands (both in the American continent and hitherto uncharted regions of Africa and Asia), they came into contact with things they had never before seen, and never before dreamed. And that translated well into text, and those texts translated well into profits. Sixteenth and seventeenth century Mandevilles and Polos proliferated, their books busying the presses of early modern printers.

Despite the small percentage of Europeans who were literate in this era, these books sold extremely well. "Travel writing," in the words of one scholar, "emerged as one of the early modern period's most popular and flexible genres, and in a wide range of

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[75] Joan-Pau Rubies, "Travel Writing as a Genre: Facts, Fictions, and the Invention of a Scientific Discourse in Early Modern Europe," *Journeys* 1, no. 1 (2000): 5-36; Mary B. Campbell, *The Witness and the Other World: Exotic European Travel Writing, 400-1600* (Ithaca: Cornell University Press, 1988); and the essays in *The Cambridge Companion to Travel Writing*, Peter Duncan Hulme and Tim Youngs, ed. (Cambridge: Cambridge University Press, 2002).
[76] Rubies, "Travel Writing as a Genre," p. 18.

forms, it entertained and educated readers, inspired national pride and commercial investment, and contributed to a public record of the world's markets, trade routes, personalities, and cultures."[77] It was also one of the sixteenth century's more obvious empirical enterprises. Thus, as Joan-Pau Rubies argued, "it is not coincidental that travel literature formed part of [the] new science."[78] It is in this genre that we see the early roots of what would later become the disciplines of ethnology, botany, and zoology. However, this was not the only reason travel books sold so well, or why they were popular among the educated elites and the barely literate alike.[79] What these books described was fascinating for those who never had, and likely never would, encounter them anywhere other than the comfort of their own armchairs. People enjoy the outlandish and the extreme, and the mundane does not pique the interest in the way that the extraordinary does, so authors wrote both what remained most clearly in their minds and what they knew their audience wanted to read.[80]

Travelers capitalized on this interest to widen the prospective audience of their work as much as possible. In the first years of the sixteenth century, for example, the Spanish lawyer Martin Fernández de Enciso abandoned his academician's robe and the

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[77] William Sherman, "Stirrings and Searchings: 1500-1720," in *The Cambridge Companion to Travel Writing*, Peter Duncan Hulme and Tim Youngs, eds. (Cambridge: Cambridge University Press, 2002), pp. 17-36, quotation from p. 20.
[78] Joan-Pau Rubies, "Instructions for Travellers: Teaching the Eye to See," *History and Anthropology* 9, no. 2-3 (1996): 139-190, quotation from p. 139. For more on the links between travel and empiricism, see Justin Stagl, *A History of Curiosity: The Theory of Travel, 1550-1800* (Australia: Harwood Academic Publishers, 1995).
[79] For the use of American travel accounts in Germany, see Christine R. Johnson, *The German Discovery of the World: Renaissance Encounters with the Strange and Marvelous* (Charlottesville: University of Virginia Press, 2008).
[80] For a broad overview of the changing cultural valence of curiosity, see Lorraine Daston and Katharine Park, *Wonders and the Order of Nature, 1150-1750* (New York: Zone Books, 1998), and Wes Williams, *Monsters and Their Meanings in Early Modern Culture: Mighty Magic* (Oxford: Oxford University Press, 2011).

somewhat insular life that accompanied it for the more adventurous one of the explorer.[81] He settled as a colonist in Española, but his restless feet soon sent him further afield, and he joined some of the early expeditions to central America, eventually ending up in Uraba (in modern-day Columbia), then in its jail after he tried to usurp power from the region's governor. He was eventually released and sent back to Spain in 1511.[82] The siren song of the west proved strong, however, and he returned to the West Indies in 1513, this time as the mayor of Tierra Firme.[83] With all the traveling he had done, he realized that the time was ripe for a work of world geography, which he wrote on the American continent. He returned to Seville in 1518 to see it through the press of Jacob Cromburger.[84] Though Enciso had no astronomical or cosmographical training, he wrote his *Suma de Geografia* partially as a practical handbook for explorers, so it was prefaced with a navigational manual for pilots and sailors, and it was the first of its kind to be published in Spanish.[85]

However, Enciso wanted the work to appeal to a broader audience, so he peppered his book with items of note and marvel that were compelling to the average non-pilot. He gave, for example, the story repeated so often in the works of Herodotus and others, that in equinoctial Africa there lived a race of giant ants so powerful that they killed humans and lions alike.[86] Perhaps less ferocious—but not significantly less worthy of marvel—

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[81] The biographical information about Enciso is from E.G.R. Taylor, "Introduction," in *A Brief Summe of Geographie by Roger Barlow,* E.G.R. Taylor, ed. (London: The Hakluyt Society, 1932).
[82] Like most other travelers, he was questioned by Martire, and his account appears in decade 2, book 3 of *De Orbe Novo*.
[83] Título de alguacil a Martín Hernández de Enciso, AGI, Panama, 233, L.1, f. 22^{r}-23^{r}.
[84] Martin Fernandez de Enciso, *Suma de Geografia que trata de todas las partidas e provincias del mundo en especial delas indias* (Seville: Jacob Cromburger,1519). The Crombergers were the most prominent printers in both Spain and the New World, where they had the exclusive privilege for printing for much of the early modern period, see Clive Griffin *Los Cromberger de Sevilla: la historia de una imprenta del siglo XVI en Sevilla y Méjico* (Madrid: Instituto de Cooperación Iberoamericana, 1991).
[85] E.G.R. Taylor, "Introduction," p. xv.
[86] Enciso, *Suma de Geografia,* f. f4^{v}-f5^{r}.

were the other animals he described as populating the African and Asian continents: lions, rhinoceroses, fireproof salamanders, unicorns, camelopards, and other improbable things that audiences expected to encounter in texts like these.[87] So, when he finally came to the geographical description of the New World, he included all the curious animals he had seen. And what was more peculiar in 1519 than a small grey quadruped that could curl itself into a ball? It was, he told his readers, beautiful to look at, but bizarre: the size of a month-old pig, but with the hooves, head, and ears of a miniature horse. It even grazed like one, and it was curiously covered from its ears to its tail by a shell that gave it the appearance of wearing the equine plate armor that would have been a common sight in the age of the Spanish *Reconquista*.[88]

There were other animals in his work: besides the more prosaic lions and tigers, he wrote of tailed cats that looked like monkeys, and "animals as large as cows, fleshy, of a brownish color, with the feet and hands like those of cows, but with the head of a mule, and with large ears." There were also lizards as wide around as calves, with a huge mouth and three rows of deadly teeth. After some work, his group killed one, and after Enciso examined it, he pronounced that its teeth were "truly, the most ferocious thing that either I, or anyone in my party, had ever seen."[89] He went into great detail about all of these new creatures, generally describing them with Old World zoological referents and declining to give them any individual names, though if he knew them, he gave the animals their

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[87] Enciso, *Suma de Geografia,* f. f4^{v}, g4^{r}, g6^{r}. On the use of wonder as a rhetorical strategy in the case of the English travel account of Francis Drake, see Sophie Lemercier-Goddard, "False Play and Dumb Show in *The World Encompassed by Francis Drake*," in *British Narratives of Exploration*, Frédéric Regard, ed. (London: Pickering & Chatto, 2009), pp. 39-50.
[88] Enciso, *Suma de Geografia,* f. h6^{r}.
[89] "die[n]tes los mas fieros que jamas vimos yo ni los q[ue] co[n]migo estava[n]," Enciso, *Suma de Geografia,* f. h5^{v}.

indigenous names.[90] This was the case an animal which he described as an animal that was like a lizard but with "a ridge of fearsome looking spines that runs from its forehead to its tail." This, he said, was called *yaguana* by the locals.[91] Exotic landscapes, peoples, plants, and especially animals from far-off lands were elements that attracted scholars and curious readers alike, and though there was no set standard of what was to be included in travelers' accounts like these, their authors nevertheless included information about the fauna of the lands they visited as a matter of course. It was as integral to this genre as describing the physical and human geography.

Many writers, especially those of the sixteenth century, tended to describe (as Martire did) the new animals as strange marvels or even singular monsters, with particular emphasis on the hybrid nature of these oddities. This is often what the French missionary Jean de Léry did in his 1578 *Histoire d'un Voyage en la Terre du Bresil*, a travel account about the time he spent among the Tupi people of Brazil in the mid sixteenth century, written in France on the basis of the journals he kept on his voyages.[92] The book not only covered his own travels, but also gave a lively account of the indigenous people and their customs, as well as the plants and animals that he had seen over his more than

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[90] On naming botanical specimens in the eighteenth century, see Londa Schiebinger, "Naming and Knowing: The Global Politics of Eighteenth-Century Botanical Nomenclature," in *Making Knowledge in Early Modern Europe: Practices, Objects, and Texts, 1400-1800*, Pamela M. Smith and Benjamin Schmidt, eds. (Chicago and London: The University of Chicago Press, 2007), pp. 90-105.

[91] "Ta[m]bien ay otros a q[ue] llama[n] Yaguanas q[ue] son grandes y como lagartos y estos tiene[n] la cabeça redo[n]da y desde la frente hasta la cola le van un cerro de espinas alçadas muy fiero son de color pardo algo pintadas," Enciso, *Suma de Geografia,* f. h5^{v}.

[92] For a biographical sketch of Léry, see Géralde Nakam, *Au Lendemain de la Saint-Barthélemy: Guerre Civile et Famine* (Pars: Editions Anthropos, 1975); Janet Whatley, "Introduction," in Jean de Léry, *History of a Voyage to the Land of Brazil*, Janet Whatley, tr. (Berkeley: University of California Press, 1992), pp. xv-xxxviii. Léry's book was incredibly popular and was reprinted in more than a dozen editions in the sixteenth century and translated into both Dutch and Latin.

two decades in Brazil. While he described the trees, roots, herbs, and fruit of the region as universally "exquisite," the animals told a different story. He began the first chapter devoted to the fauna by telling his reader: "I will advise you briefly at the beginning of this chapter that as far as animals are concerned, not only in general, but without exception, there are no animals in this land called Brazil in America that in all their particulars resemble our own."[93] The headings of these chapters only served to reinforce this point: the first promised descriptions of the "monstrous beasts of America," and the second, an account of "strange vermin."[94]

Léry had no ready names for these animals, and how could he, if he thought them to be, without exception, poles apart from their Old World counterparts? Instead, he had to give them their native names, and with no other way to classify them, he decided to group them according to their utility for humanity, starting with those that were edible. What followed was a veritable litany of strangely described beasts. There was the *tapitouſſou*, an animal that, though being half cow and half ass, "nevertheless it was entirely different from either of them, since the tail is too short […] and its teeth are too sharp and pointed."[95] There was also the *ta-iaſſou*, which looked like a boar, except that it used its mouth only for eating and breathed through a hole in its back like a porpoise; and the *pag*, a rodent the size of a mastiff. He also ran into a "monstrous and terrifying" lizard the size

[93] "J'advertiray en un mot au co[m]menceme[n]t de ce chapitre des Animaux à quatre pieds, que non seulement en general, & sans excepcio[n], it ne s'en trouve pas un seul en ceste terre du Bresil en l'Amerique, qui en tout & par tour soit semblable aux nostres," Jean de Léry, *Hiſtoire ∂'un Voyage en la Terre ∂u Breſil, autrement ∂ite Amerique* (La Rochelle: Antoine Chuppin, 1578), p. 151.

[94] "bestes monstruses" and "vermines estranges," respectively. Léry, *Hiſtoire ∂'un Voyage*, pp. 151, 170.

[95] "on peut dire qu'elle est demie vache & demi Asne. Neantmoins elle differe entierement de tous les deux, tant de la queue qu'ell a fort courte […] que des dents lesquelles ell a beaucoup plus trenchantes & aigues," Léry, *Hiſtoire ∂'un voyage*, pp. 151-152.

of a man's body that, he was told, "delighted in the human face," though Léry was told after his first terrifying encounter with one that it "took as much delight in looking at us as we had fear in looking at it."[96] There were also true predators, things the Tupi called *jan-ou-are*, which had beautiful spotted coats and were more ferocious than lions.[97] The names were certainly unfamiliar, but Léry hoped that the descriptions would at least provide some form of reference.

These animals were strange indeed, but he saved, he told his readers, the best for last: the *hay* and the *coati*.[98] The first he described as having the face of a monkey and the belly of a pregnant sow and the curious ability to live on nothing but air. Lest his readers think he was telling tall tales, he assured them that his observations were corroborated by Amerindians, and even the Europeans who had spent a great deal of time there. The *coati* was no less strange, with a nose like the drone pipes on a bagpipe. "It is not possible," he wrote, "to find a more bizarre thing as this."[99] He added these animals not because they were of any significance to humanity, which was the organizing principle he set out in the beginning of the chapter. He did make a half-hearted attempt to argue that the *hay* could be tamed, but he had to concede that they seldom were, since the animals had very sharp claws, an appurtenance that did not go well with the Tupi habit of not wearing much in the way of clothing. These animals were, unlike most of the things that interested Europeans looking towards the New World, not commodities, nor were they

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[96] "monstreaux & espouventable Lezard"; "suyvant l'opinion de plusieurs, qui dissent que le Lezard se delecte a conte[m]pler la face de l'ho[m]me, que cestuy la avoit prins ausi gra[n]d plasir a nous regarder, que nous avions eu de peur à le considerer," Léry, *Histoire d'un Voyage*, p. 162.
[97] Léry, *Histoire d'un Voyage*, p. 163.
[98] Léry, *Histoire d'un Voyage*, p. 167. What Léry described as the coati is not the animal known by this name today, but (likely) an anteater.
[99] "il n'est pas possible de voir un museau plus bizerre," Léry, *Histoire d'un voyage*, p. 168.

commodifiable. And it was precisely this that drew Léry and others like him to take a closer look at the animals of the American continent.

Léry never stopped marveling at the differences he found. He even implored a person called Jean Gardien, the only person in their company skilled in art, to draw the "many others [animals] which are not only rare, but completely unknown over here."[100] Though that artist never made time for his request, the mental image Léry painted for his readers was one where monstrous creatures roamed the land, an image that was put in pictorial form in a 1594 Latin translation of the work, where—amidst a scene depicting the alleged depravations of the native population— the engraver placed several of the animals described in the preceding chapters, as well as some others from his own imagination.[101] **[Figure 2.2]** In the image, a *hay* lurks in the top right corner, and though Léry described it as only the size of a large spaniel, the engraver blew it up to dwarf the size of the human figures themselves, making the curiously described animal seem far more monstrous because of its size.[102] The woodcut also depicts a pair of caudal monkeys hanging on the trees near the Tupi huts, just as the text described them, as well as a sea monster that shares the ocean with a European galleon and a trio of flying fish, while two dragons-like creatures fly through the sky. Léry described neither sea monsters nor dragons, but the

[100] "de contrefaire tant cesluy la que plusieurs autres non seulement rares, mais ausi du tout incogneues par deça," Léry, *Histoire d'un Voyage*, pp. 168-169.
[101] Jean de Léry, *Historia Navigationis in Brasiliam quae est America dicitur* (Geneva: Eustathe Vignon, 1594), p. 225. On depictions of anthropophagism in maps of the new world, see Surekha Davies, *Renaissance Ethnography and the Invention of the Human: New Worlds, Maps and Monsters* (Cambridge: Cambridge University Press, 2016), chapter 3. Davies argues that the iconography in maps predated the publication of travel accounts like Léry's, though they did influence mapmakers after the 1590s, see Davies, pp. 65-66, 110.
[102] Léry described the *hay* in *Histoire d'un Voyage*, p. 169.



Figure 2.2: Jean de Léry, *Historia Navigationis in Brasiliam*

engraver included them anyway, responding, again, to his assumption about the animals that populated the New World.[103]

Not half a century after Léry, in 1612, the French Franciscan Claude d'Abbeville also went to Brazil as a missionary.[104] He traveled to the island of Maragnan (in modern north-east Brazil) with the first colonizing mission for the short-lived French equinoctial empire. He spent a total of four months there and wrote an account of his experience,

[103] On the presence of sea monsters in European imaginations, and the rationale behind their inclusion in maps, see Chet Van Duzer, *Sea Monsters on Medieval and Renaissance Maps* (London: The British Library, 2013). His argument can be extrapolated to other illustrations that are not strictly cartographical.

[104] On seventeenth century French colonization attempts, see Olive Patricia Dickason, "The Sixteenth Century French Vision of Empire: The Other Side of Self Determination," in *Decentering the Renaissance: Canada and Europe in Multidisciplinary Perspective, 1500-1700*, Germaine Warkentin and Carolyn Podruchny, eds. (Toronto: University of Toronto Press, 2001), pp. 87-109. On Brazil and d'Abbeville's expedition in particular, see ibid. pp. 103-106. See also Laura Fishman, "Claude d'Abbeville and the Tupinamba: Problems and Goals of French Missionary Work in Early Seventeenth-Century Brazil," *Church History* 58, no. 1 (1989): 20-35.

which was published in 1614, a year after his return.[105] Like Léry's book, d'Abbeville's *Histoire de la mission des pères Capucins en l'isle de Maragnan* was mainly a work of ethnography, but hooked its readers with thrilling tales of the "admirable singularities and marvelous customs of the Indians that inhabit these lands," promised in the title page.[106] Also like Léry, though his work was mainly ethnographical, d'Abbeville was astounded at the amount and variety of the natural world, especially of the animals. There were so many birds, for example, that he confessed it was impossible for him to even be sure of how many species lived in that part of Brazil.[107] And if the air was full of birds, its waters were no less marvelously populated by fish, and he could "no more number them than I can count stars in the sky."[108] Though he reasoned that the warm climate contributed to this near-infinity of forms, he still stressed that the fecundity was a direct act of God. "It seems," he told his readers, "that God and Nature had studied one another, particularly in order to populate this country with animals that are more admirable than in any other region."[109] In this, he echoed the Franciscan understanding of Thomistic natural theology, which saw the natural world as a mirror that could approach — though never surpass —

[105] For its publication history, see Andrea Daher, *Les Singularités de la France Équinoxiale, Histoire des Pères Capuchins au Brésil (1612-1615)* (Paris: Champion, 2002).
[106] "ou est traicte des singularitez admirables & des Meurs merveilleuses des Indiens habitants de ce pais," Claude d'Abbeville, *Histoire de la Mission des Peres Capucins en l'Isle de Marganan*… (Paris: François Huby, 1614). On the ethnographic tradition, see Sabine Maccormack, "Ethnography in South America: The First Two Hundred Years," in *The Cambridge History of the Native Peoples of the Americas*, Frank Salomon and Stuart B. Schwartz, eds. (Cambridge: Cambridge University Press, 1999), pp. 96-187, on this work in particular, see pp. 110-115.
[107] d'Abbeville, *Histoire de la mission*, f. 231^{v}.
[108] "Et n'estant possible particulariser toutes les diverses sortes des Poissons qui se retrouvent là, non plus que de nombrer les Estoilles du Ciel," d'Abbeville, *Histoire de la mission*, f. 243^{r-v}.
[109] "il semble à voir que Dieu & Nature se soient estudiez particulariement à prouvoir ce Pays d'animaux admirables sur toutes les autres Regions," d'Abbeville, *Histoire de la mission*, f. 231^{r}.

the magnificence of God.[110] The abundance of animals was, therefore, a reflection not of the monsters that nature kept hidden away in the recesses of the world, but of what d'Abbeville saw as the "wisdom and providence of God."[111]

As a reflection of the action of the divine, then, these animals were part of the normal course of creation. Gone were the "monstrous beasts" and "strange vermin" of Léry. Even when d'Abbeville used the term "marvel" in his title, though he was working within the discourse of the marvelous that had emerged in the Middle Ages, his writings reflected a shift towards what Lorraine Daston and Katherine Park called preternatural philosophy. This was a new kind of philosophy that "dramatically expanded the purview of natural philosophy to include marvelous effects of all sorts."[112] Though both his own relentless cataloging, and the comprehensive effort by other travel writers to list and describe the natural world, he came to the conclusion that Brazilian animals were simply incomparable (in the most literal sense of the word) to European ones.[113] Gone, then, was the tradition of making Brazilian animals knowable to a European audience by reengineering them from Old World parts, as we saw with Martire and Léry. In d'Abbeville's understating, the Brazilian animals were so disparate as to be incommensurable with the ones previously known in Europe.[114] D'Abbeville's choice for the criteria of inclusion also reflected this trend towards normalization. Léry, as discussed

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[110] Jordan Kellman, "Environmentalism, Ethnography and Franciscan Natural Theology on the French Colonial Frontier: Claude D'Abbeville's Tupinambá Encounter, 1612-1613," *Proceedings of the Western Society for French History,* 39 (2011): 27-30.
[111] "la Sapience & Providence de Dieu," d'Abbeville, *Histoire de la mission*, f. 243^{r}.
[112] Daston and Park, *Wonders and the Order of Nature*, p. 137. On preternatural history and the New World, see pp. 146-149.
[113] d'Abbeville, *Histoire de la mission*, f. 231^{r}.
[114] The term incommensurability is taken from Kuhn, who used it to characterize different ways of seeing the world that clashed during what he called the scientific revolution, Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: The University of Chicago Press, 2012), pp. 147-149.

above, ordered the animals according to their utility to the Amerindians, but he focused on those he found the most bizarre, so much so that he included two animals that were relatively useless for the Tupi only because they were too marvelous not to include. D'Abbeville, on the other hand, wrote that since there was such a great diversity, he would concentrate only on the most common and abundant ones.[115] However, these two men described the same kinds of animals—things like anteaters, sloths, peccaries, and armadillos—even though the former called them the strangest of all the animals he saw, and the latter called them the most common. Notable about d'Abbeville's characterization was the fact that, a scant few decades before, these creatures were not just odd animals, but monsters so alien that their very status as part of nature's order was far from assured.

Since d'Abbeville focused on the most common animals, he also included some things that Léry did not, like deer (called by the Tupi s*ouässou apar*) and squirrels (*ꞩouässou*). In doing so, he showed that there was plenty of commonality between the fauna of America and Europe. So, when he described the *tapiyre*, for example, he was attentive not only to what made it marvelous, but what made it recognizable. It was, he wrote, simply a type of wild cattle from which one could extract bezoar stones.[116] Unlike the 'jigsaw' tradition employed by earlier authors, d'Abbeville did not say that the animal was *like* a cow. Instead, he described it as a variation on that species, a wild cow.[117] Even animals like armadillos, which were truly different from animals known in Europe, were described as part of the normal course of nature. D'Abbeville was the first European

[115] d'Abbeville, *Histoire de la mission,* f. 243^{r-v}.
[116] d'Abbeville, *Histoire de la mission,* f. 250^{r}. On the importance of bezoars in early modern Europe, and the search for them in the animals of the New World, see Mackenzie Cooley, "The Stone in the Beast: Bezoars, Global Medicine, and Natural Order," forthcoming in *Natural Things: Ecologies of Knowledge in the Early Modern World*.
[117] "Vaches braves ou Vaches sauvages," d'Abbeville, *Histoire de la mission,* f. 250^{r}.

traveler to note in print that there were several different types of armadillos, which he called by the Tupi name, *tatou*.[118] He methodically described the varieties, and while he gave much of the same information about this animal as Enciso did in the passage quoted above, d'Abbeville did so in a much more matter-of-fact way. It was difficult for d'Abbeville or his readers to think of armadillos as bizarre anomalies when they were not just common, but a species with many varieties, like any common rabbit.

In other seventeenth century books describing early modern travel, a similar matter-of-factness prevailed. After assuring his readers that he was "no Compiler by hearsay, but have been a reall Actor" in the early history of Virginia, John Smith began his account of his time in that English colony by stressing how he had "deeply hazarded my self in doing and suffering," and had no intention of hazarding his reputation by writing falsehoods.[119] Like other travel writers, he advertised his work as a rollicking tale of danger and adventure, but also one that contained irrefutable truths given by a reliable eyewitness. These were all tropes of the genre by the seventeenth century, and this text was nothing if not programmatic. So, as in nearly all the books of this genre, Smith gave the now habitual list of the animals of the region. His bow to convention was spread out over a mere page and covered the information that in earlier authors would have formed the basis of several chapters. There were deer, he wrote, similar to our own; an animal like a badger called the *aroughcun*; a small beast called an *assapanick*, though the English called them flying squirrels; and the *mussascus*, which was an animal that smelled of musk and was the size of a water rat. Even the "opassom," a creature that had caused such

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[118] d'Abbeville, *Histoire de la mission,* f. 250^{r}-251^{r}.
[119] John Smith, *The Generall Historie of Virginia, New-England, and the Summer Isles: with the names of the Adventurers, Planters, and Governours from their first beginning An[n]o 1584 to this present 1626* (London: Michael Sparkes, 1627).

admiration in the years before, was given a similarly perfunctory treatment: "Under her belly shee hath a bagge, wherein she lodgeth, carrieth, and suckleth her young" was all he wrote about that animal.[120] Seasoned readers were already familiar with American animals, even those of North America, and though Smith recognized that an enumeration of a land's animals was part of the genre, he saw no reason to expand on it further.

Travel literature enjoyed many readers. By the end of the seventeenth century, there were more than 1,300 travel accounts published in French alone, with similar numbers for other European languages.[121] At the height of this craze, the poet Jean Chaplain wrote that France had "changed its reading taste. Instead of novels, which have declined in popularity […], travel literature has been on the rise and is now all the rage at court and in the cities."[122] It was not just travelers themselves publishing their stories. Compilers like Richard Eden, Theodor de Bry, Richard Hakluyt, Giovanni Ramusio, and Samuel Purchase all brought together the works of various authors into compendia of foreign lands. All of this meant that readers were inundated with descriptions of (among other things) new fauna. Accounts that a discerning reader today might count as fabulous did sometimes remain in these travel books—and indeed, more scholarly works as well.[123] De Bry, for example, published a series of books about the American continent with

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[120] Smith, *The Generall Historie of Virginia*, p. 27.
[121] Statistics from Sara E. Melzer, "The French *Relation* and its 'Hidden' Colonial History," in *A Companion to the Literatures of Colonial America*, Susan Castillo and Ivy Schwitzer, eds. (Malden, MA: Blackwell Publishing, 2005), pp. 223-225. For travel literature in a German context, see Johnson, *The German Invention of the World,* chapter 1.
[122] Quoted in Melzer, "The French *Relation*," p. 223.
[123] On the interconnectedness of myth and reality in New World travel narratives in particular, see Joan-Pau Rubiés, "Futility in the New World: Narratives of Travel in Sixteenth-Century America," in *Voyages and Visions: Towards a Cultural History of Travel*, Jaś Elsner and Joan-Pau Rubiés, eds. (London: Reaktion Books, 1999), pp. 74-100.

content recycled from earlier accounts.[124] His main intervention, however, was to add his own engravings to the text—though these too were culled from other sources.[125] In 1619, he had an image cut to illustrate a story about the 1499-1500 Spanish expedition to Cabo de la Vela under Alonso de Ojeda.[126] The group found in a village animals that they described as snakes with feet and wings being kept in preparation for cooking, and the picture itself shows them marveling at a trio of serpents highly suggestive of medieval dragons with their leonine paws and curled tails. **[Figures 2.3 and 2.4]** However, by and



Figure 2.3: Serpents, Théodore de Bry's *Americae* (1619), icon iv.

[124] Michel van Groesen, *The Representations of the Overseas World in the De Bry Collection of Voyages: 1590-1634* (Leiden and Boston: Brill, 2008), especially chapter 1, pp. 23-49. On natural history in de Bry, see chapter 5, pp. 139-174. For a list of the travel accounts de Bry used, see van Groesen, Appendix 2, pp. 493-507.
[125] On the watercolors by John White from which of many of de Bry's engravings are taken, see Kim Sloane, *A New World: England's First View of America* (Chapel Hill: The University of North Carolina Press, 2007). For a list of the sources for all engravings, see Van Groesen, *Representations of the Overseas World*, Appendix 3, pp. 509-523.
[126] On engravings representing the New World, see Michael Gaudio, *Engraving the Savage: The New World and Techniques of Civilization* (Minneapolis: University of Minnesota Press, 2008).



Figure 2.4: Dragon, c.1278–1300, The J. Paul Getty Museum, MS. Ludwig XV 4, fol. 94

large, European readers had a sense of the animals that lived in these regions, and by normalizing the monstrous, works like these also made readers more discerning in their credulity of certain texts. Enciso, in his *Suma de Geografia*, for example, wrote that in England, there were certain trees whose leaves, when they fall into water, turn into fishes, and when they fall onto land, they turn into birds.[127] A seventeenth century reader of this wrote in the margin: "I'm not sure I believe this about birds and fish arising from leaves."[128]

[127] Enciso, *Suma de Geografia,* f. c3^{v}. On the long tradition of the belief that certain birds and fish came from trees, see Peter Mason, *Before Disenchantment Images of Exotic Animals and Plants in the Early Modern World* (London: Reaktion, 2009), chapter 2.
[128] "N[ota]: Aves y peces de ojas de arboles yo no se si lo creo," in Enciso, *Suma de Geografia,* f. c3^{v}, copy held in the Biblioteca Nacional de España (BNE), R/2500.

Rise of Lay Empiricism

Over the course of the sixteenth century and into the seventeenth, authors and compilers of travel literature stressed, more and more, the value of these books not just as entertainment, but as serious works of natural observation, and that the two need not be anathema. For example, François Leguat, a French Huguenot who wrote a book about his late seventeenth century travels in the West Indies, stressed his ability to be a credible observer, and for his observations to be widely accessible. "For me," he wrote in the preface, "I write in French, and my simple French, neither aspiring to a great degree of style or beauty, rather only what is necessary in order to be understood; nor writing in any *supernatural* language."[129] In this, he paralleled other authors of works of natural philosophy, who in the seventeenth century began to explicitly renounce the Latin of their intellectual predecessors in favor of their own vernaculars.[130] Galileo, for example, wrote some of his works in his own Tuscan dialect, and discussing his *Letters on Sunspots*, told a friend that he "wrote in the colloquial tongue because I must have everyone able to read it."[131] Even more forcefully than Galileo, Descartes insisted that using the vernacular was integral to the development of a new science. "And if I write in French, the language of my

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[129] "Pour moi, donc, j'écris en François; en mon simple François: n'aspirant, ni à un plis haut degré de beauté de Style, qu'a celui qui est necessaire pour être entendul ni à aucun Languge *surnaturel*," François Leguat, *Voyages et aventures de Francois Leguat, et de ses compagnons…. Tome premier* (London: David Mortier, 1708), p. xv, emphasis in the original.

[130] Peter Burke, *Languages and Communities in Early Modern Europe* (Cambridge: Cambridge University Press, 2004). Not everyone did this, of course, and Latin remained the language of scholarship well into the Enlightenment, see Thorsten Fögen, "Latin as a Technical and Scientific Language," in *A Companion to the Latin Language*, James Clackson, ed. (Malden, MA: Wiley-Blackwell, 2011).

[131] Galileo to Paolo Gualdo, quoted in Galileo Galilei, *Discoveries and Opinions of Galileo*, Stillman Drake, tr. and ed. (New York: Anchor Books, 1957), p. 84. Galileo had other less catholic reasons for writing that particular text in Italian, but he nevertheless clearly had an interest in using a new language to discuss his new scientific technologies and discoveries, see Elizabeth Spiller, *Science, Reading, and Renaissance Literature: The Art of Making Knowledge, 1580-1670* (Cambridge: Cambridge University Press, 2007), pp. 111-112.

country, rather than in Latin," he said in the *Discourse on Method*, "it is because I am hoping that those who use only their natural reason in all its purity will judge my opinions better than those who believe in old books."[132] Leguat's justification for writing in French echoed that laid down in the *Discourse*, and he clearly believed that his own work would contribute to the knowledge-production of his era in natural history, just as Galileo and Descartes did for natural philosophy.

In the part of Leguat's travel account that dealt with animals, then, he included both descriptions and images, but he also used the opportunity to criticize other authors' errors, and to tout the supremacy of firsthand observations. So, while many readers picked up travelogues as a source of entertainment, their authors increasingly saw themselves as serious scholars of the natural world. For example, in describing what he called a crocodile, he wrote that he had little patience for "the common opinion in both that country, and among ancient naturalists, that this animal constantly grows throughout its life. This has the appearance of falsehood on it."[133] He also noted that there were other stories told about this creature which were so ridiculously false to even justify including them.[134] While he did conflate what modern zoology now classes as two different species, he nevertheless used his firsthand experience with so-called crocodiles in the West Indies to debunk myths perpetuated about their African look-alikes.

It was not just ancient authors who earned Leguat's ridicule—he lambasted his near contemporaries as well. He encountered, for example, several animals that he called

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[132] René Descartes, *Discourse on Method,* Donald A. Cress, tr. (Indianapolis and Cambridge: Hackett, 1998), p. 43.
[133] "L'opinion commune est en ce païs-là comme parmi les anciens Naturalistes que cet animal croît tant qu'il vit. Mais cela a tout l'air d'une fable. Je laisse les autres contes qu'on en fait," François Leguat, *Voyages et avantures*, p. 93.
[134] François Leguat, *Voyages et avantures*, p. 93.

lamentins off the coast of the island where he and his shipmates had been marooned. These animals, he told his readers, traveled in large packs, and had somewhat porcine heads "whatever is said in the Dictionary of Arts and Sciences by Mr. Corneille, on the article of this fish."[135] In consulting that 1694 encyclopedia, Leguat would have read, first and foremost, that the manatee was a "prodigiously large sea monster," and that it sometimes swallowed people whole.[136] He took great issue with this description (and its overall classification as a fish), arguing that the dictionary, "in many areas that are part of my areas of expertise, is frequently subject to gross errors, since [it] is the most incomplete dictionary that has ever been made."[137] After that stinging rebuke, he concluded that it would result in "inevitable embarrassment for those who try to describe and represent these things which they have never seen, and about which they do not even have the slightest idea."[138] Instead, he offered his own observations, and those of his companions, and provided the readers with an engraving of a mother and her offspring nestled next to a very mammalian mammary gland.[139] **[Figure 2.5]** Travel, for him, provided more than a way to tell interesting stories of the hardships he endured, and the unusual (but not monstrous) creatures he encountered. Instead, he saw himself as actively contributing to the world's store of zoological (and other) knowledge. It was quite commonplace to call

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[135] "Sa tête ressemble extrêmement à celle du Porceau, quoi qu'en dise le *Dictionnaire des Artes & des Sciences* de Mr. *Corneille,"* Leguat, *Voyages et avantures*, p. 93.
[136] "Monstre marin qui dest d'une si prodigieuse grandeur," Thomas Corneille, *Le dictionnaire des arts et des sciences* (Paris: 1694), p. 599.
[137] "comme […] en beaucoup d'autres choses qui sont de ma connaissance certain, est sujet à de frequentes & grossières erreurs, comme il est d'ailleurs le Dictionnaire le plus incomplete qui ait jamais été fait," Leguat, *Voyages et avantures*, p. 93.
[138] "il tombe en cette occasion dans l'inévitable embarras de tous ceux qui entreprennent de décrire, & de representer des choses qu'ils n'ont pas vûës, & dont ils n'ont pas d'idée distincte," Leguat, *Voyages et avantures*, p. 94. His use of clear and distinct shows the Cartesian influence on his work.
[139] Leguat, *Voyages et avantures*, pp. 93-94.

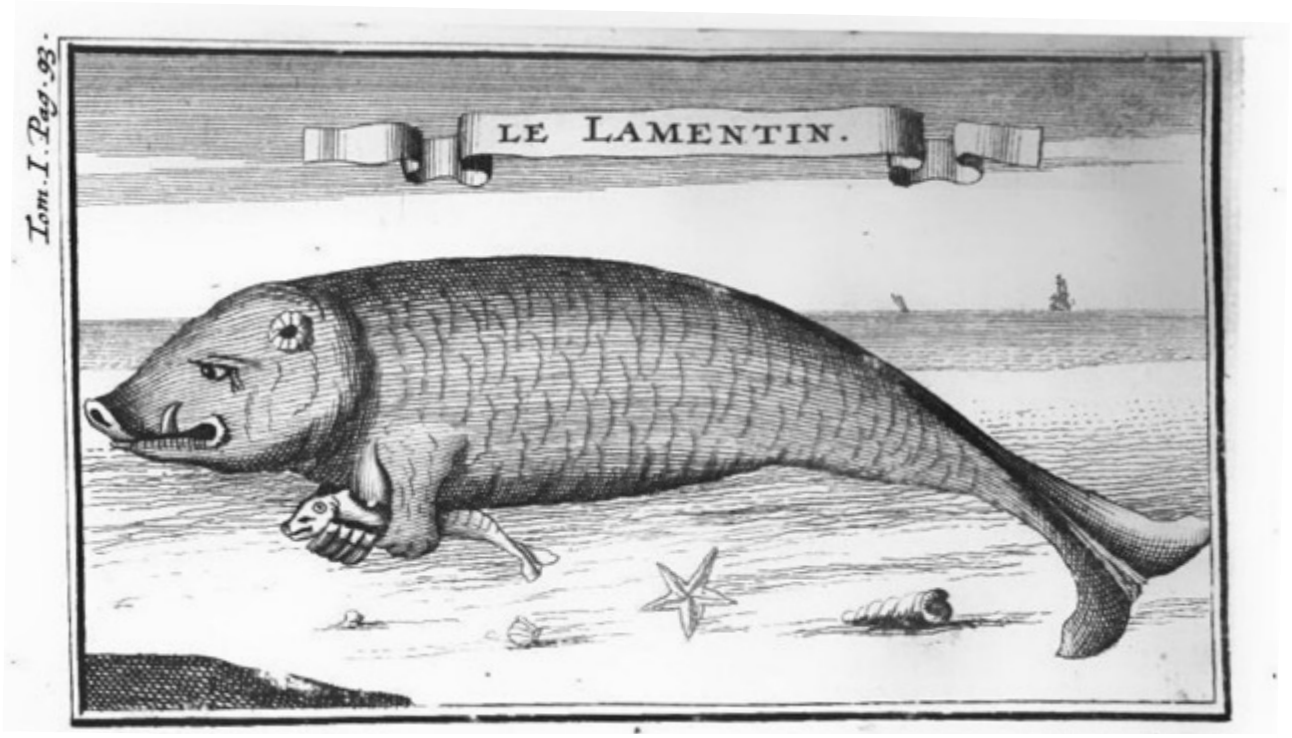

Figure 2.5: Lamentin, Leguat's *Voyages*, 1708

out popular misconceptions that had harmlessly passed from the works of the ancients to the popular consciousness. Leguat was by no means alone in doing this. He was simply adding another trifling complaint to a towering pile of denunciations of received authority. However, his pointed barbs were also aimed at his contemporaries, men like Corneille, whose works purported to represent the sum of human knowledge, but failed so spectacularly. By the early eighteenth century, the strong links between travel and the active creation of knowledge were clear, and none of his contemporaries would have questioned his claim to authority.[140]

Conclusion: Did Epistemology Matter?

Generations of travelers to the New World brought their stories back to Europe. Sometimes, they told their exploits to people who would later publish general accounts

[140] For more on the links between travel and empiricism, see Stagl, *A History of Curiosity*.

like those of Martire and de Bry. Sometimes, they wrote their own tales of their travels, as did Enciso, d'Abbeville, Léry, and Leguat. Whatever their origins, these books sold well and were consumed voraciously by literate Europeans. They were so popular that some people even used the well-established tropes of the genre to simply fabricate stories out of whole cloth.[141] At stake was more than entertainment, however. These works made animals like the opossum, the anteater, or the armadillo available to generations of European readers, and fixed these animals in the popular consciousness. In the earlier years of the conquest, it was impossible not to note the tone of wonderment and admiration authors of travel accounts had for the strange animals in the New World. Their authors struggled to describe these animals in ways that their audience would understand, and the textual hybrids they created often did little to disabuse Europeans of the notion that the edges of the world harbored nearly unimaginable monsters. However, the sheer popularity and abundance of these texts led to endless descriptions of the same type of monster. All of this had a normalizing effect for the epistemologically problematic animals that so puzzled earlier authors. It was, after all, a contradiction in terms to have a multitude of monsters, and it became simply untenable to continue to refer to something that was obviously so commonplace (even if different from anything else described in a natural history or a bestiary) as a singular monster.

On a more general level, this chapter shows how wonder as both a category and a sentiment changed over the course of the early modern period. As this chapter shows, wonder was replaced by a more down-to-earth curiosity in both the authors and the

[141] The most famous example in that category is *George Psalmanazar*'s sustained hoax that he was from Formosa when he was in fact a Frenchman. Michael Keevak, *The Pretended Asian: George Psalmanazar's Eighteenth-Century Formosan Hoax* (Detroit: Wayne State University Press, 2004).

readers of the books described in this chapter. Travel literature, especially works that described the American continent, at first sustained a sense of wonder only to eventually undermine it. Early authors marveled at the alterity of the region, and in particular called out the wonderous beasts as things worthy of amazement and awe, while later works called out the same creatures, but as examples of the normal (albeit interesting) creatures of the region. Greater knowledge of the American continent is certainly not the only factor for the demise of wonder in the eighteenth century. As Lorraine Daston and Katharine Park pointed out, in the Enlightenment, "the passion of wonder […] shifted its objects and altered its texture almost beyond recognition." Rather than debunk marvels, they argue that eighteenth century philosophes chose to ignore them, excluding them from the realm of the possible.[142] Looking at travel literature, however, we see that far from ignoring marvels, this genre embraced them so much that it ended up smothering them, adding a new element to a larger understanding of wonder. Wonder had to give way to curiosity, a passion that, while similar, had a far different valence.

Thus, far from the dazzling heights of amazement of earlier authors, the main feature of the descriptions became less and less a sense of wonder or bewildering novelty. By the beginning of the seventeenth century, we see that d'Abbeville's account is full of down-to-earth pragmatism. He even gave advice on what to eat when faced with a plethora of armadillo dining options (of all the many varieties, he suggested the *tatou-apar*, easily recognizable because it was the only one that could roll itself up completely into a ball). Though he— like Léry, Enciso, and so many others who wrote travel accounts of the New World— was astonished by the animals he encountered, he interpreted the diversity (and

[142] Daston and Park, *Wonders and the Order of Nature*, pp. 361-362.

the fecundity) of these animals differently. No longer was it a marvel directed at the strangeness of the fauna, but an acknowledgment of the reach of his God's power, and something that fit into the scope of his Franciscan natural theology.[143] This link was also made in the minds of the many readers of this type of literature. While it was true that the average reader was looking for entertainment, not epistemology, readers over time were privy to a huge shift in how people (and not just learned scholars) understood animals. In the end, this change was not witnessed largely by learned audiences reading treatises or weighing in on medical disputes in the way that botanical knowledge was.[144] While both animals and plants were central to natural history, they were not treated the same in popular literature.

American animals, particularity because of the sense of wonder they initially evoked, were a mainstay in nearly every early modern travel account. Early modern writers dedicated pages of text and hundreds of illustrations to them, but thorough animal descriptions eventually became a victim of the genre's popularity. By the eighteenth century, the reading public was well aware of the animals in the Americas, and certainly no longer considered them as anything but commonplace. A perfect example comes from the French Benedictine monk, Antoine-Joseph Pernety. In 1762, he joined an expedition to the Falkland Islands as a naturalist and chaplain. Upon his return to France at the end of 1764, he was expelled from the Benedictine order, founded a sect of illuminati in Avignon, fell afoul of the Avignon Inquisition, and went into exile in Berlin where he

[143] Kellman, "Environmentalism, Ethnography and Franciscan Natural Theology."
[144] For this parallel, but different story, see Brian Ogilvie, *The Science of Describing. Natural History in Renaissance Europe* (Chicago: University of Chicago Press, 2006).

found employment in the library of Frederic II.[145] Somehow, he also managed to find the time to write a two-volume account of his travels through South America, which he published in 1769. In it, he told his readers that he had visited Buenos Aires and had seen for himself that animal which was "very common in those regions," a *tatu-apara*, which the Spaniards called the armadillo. "Since this animal is so well known," he told his readers, "I will not give any description of it at all."[146]

[145] On Pernety's life, see Micheline Meillassoux-Le Cerf, *Dom Pernety et les Illuminés d'Avignon* (Milan: Archè, 1992).
[146] Antoine-Joseph Pernety, *Journal historique d'un voyage fait aux îles Malouines en 1763 et 1764 pour les reconnoître et y former un établissement et de deux voyages au détroit de Magellan avec une relation sur les Patagons*, tome I (Berlin: Etienne de Bourdeaux, 1769), p. 398.

CHAPTER 3: NEW HISTORIES FOR A NEW WORLD

Introduction:

In 1534, the Spanish city of Cádiz was a-bluster with activity. A great fleet of ships—the largest since Columbus's second voyage to the Indies—was being prepared for an expedition to a part of America that was rumored to be so rich in silver that a person could simply wade into the rivers and pick up massive ingots of that precious metal. However, problematically for the Spanish, news of this wealth had also reached the ears of the Portuguese king, who had already sent a group of soldiers to extend the southern border of his Brazilian possessions in the hopes of expanding Portuguese hegemony in the region.[1] More worryingly, the Portuguese had already established the colony of San Vicente in the region, and it was much larger than any nearby Spanish colony. In order to assert Spain's presence, king Charles V had signed a contract giving the explorer Pedro de Mendoza the rights to "conquer and populate the lands and provinces that lie along the River Solís, otherwise known as the Rio de la Plata."[2] In a joint public-private enterprise, Mendoza outfitted an expedition to swell the numbers in the nearby Spanish outpost of Iguape and enforce the terms of the 1494 Treaty of Tordesillas, which technically constrained the limits of Portuguese expansion in the New World but never unequivocally

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[1] For more, see, Luis L. Dominguez, "Introduction," in *The Conquest of the River Plate: Voyage of Ulrich Schmidt to the Rivers La Plata and Paraguai*, Luis Dominguez, tr. (London: Hakluyt Society, 1891), pp. xiii-xxxvii; Marion Lois Huffines, "The Original Manuscript of Ulrich Schmidl: German Conquistador and Chronicler," *The Americas* 34, no. 2 (1977): 202-206.

[2] "De ir a conquistar y poblar las tierras y provincias que hay en el rio de Solís que llaman la Plata," in "Capitulación que se tomó con Don Pedro de Mendoza, para la conquista del rio de la Plata," in *Colección de Documentos Inéditos al Descubrimiento, Conquista y Organización de las Antiguas Posesiones Españolas de América y Oceanía*, Volume XXII, Joaquín Francisco Pacheco, Francisco de Cárdenas, and Luis Torres de Mendoza, eds. (Madrid: Manuel Hernández, 1874), pp. 350-360, quotation from p. 350.

set a precise distance that would be the border between these two countries.[3] The treaty had not stopped eastward Portuguese expansion in Brazil, but the Spanish monarch hoped that armed soldiers would. Mendoza— using a small fortune of his own, as well as funds raised by other conquistadors and merchants heavily invested in the success of a settlement along the banks of such an auspiciously named river— began preparations for this expedition soon after his orders were signed. In 1535, fourteen ships were anchored in the harbor at Cadiz.[4] By all accounts, it was an impressive sight: Gonzalo Fernández de Oviedo, who later became the official chronicler for the history of the Indies, saw the expedition set sail from Seville, and wrote that it was "a company fit to make a show in Caesar's army in any part of the world."[5]

Of the fourteen ships that set sail that day, two of them were financed by wealthy merchants. The first was supported by Jacob Wesler, representing the Nuremburg branch of that family's German merchant house, and second was funded by the Augsburg merchant Sebastian Neidhart. Those ships carried people from various parts of northern Europe, all of them central to protecting German interests in the New World.[6] Though these people were not Spaniards and accounts list these 150 men from northern Europe as

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[3] Henry Harrisse, *The Diplomatic History of America: Its First Chapter 1452-1493-1494* (Dubuque, Iowa: W.C. Brown, 1962), pp. 194-200.
[4] Dominguez, "Introduction," *The Conquest of the River Plate*, p. xxiv.
[5] "Y sin duda era compañía para parescer bien en el exército de César y en todas partes del mundo," Gonzalo Fernández de Oviedo, *Historia General y Natural de las Indias,* Tomo 1, parte 2 (Madrid: Real Academia de la Historia, 1852), book XXIII, chapter VI, p. 181. Unless otherwise indicated, all citations from the *Historia General y Natural* (*HGNI*) are from this edition. At the time, Oviedo was in Spain after the publication of his first book, the *Sumario de la Natural Hystoria de las Indias* (Toledo, 1526).
[6] For more on the German role in the conquest of America, see Germán Arciniegas, *Los Alemanes en la Conquista de América* (Buenos Aires: Editorial Losada, 1941), especially pp. 162-164 for the Mendoza expedition; Marl Häberlein, "Conquista," in *Germany and the Americas: Culture, Politics, and History,* volume 1, Thomas Adam and Will Kaufman, eds. (Santa Barbara, CA: ABC-CLIO, 2005), especially pp. 254-256.

foreigners, they were just as much the subjects of Charles V, Holy Roman Emperor, as Spaniards were the subjects of the same Carlos I, Spanish king. One of these men was Ulrich Schmidt, a native of Straubing in Bavaria, who had left Antwerp in 1534 specifically to accompany the expedition.

Schmidt kept a diary of his trip, and his account provides the only first-hand description of the events that befell Mendoza's expedition. It told of the months-long ocean voyage, landfall in February of 1536, the foundation of the city called Santa María del Buen Aire, and of the counterattack the local Amerindians led against the Spanish after the latter decimated their village and raided it for food. He also wrote of the almost unimaginable hardships of the expedition, the expedition's furious struggle to stay alive, and his eighteen years of bad luck in South America. Schmidt's narrative was, at its heart, an anti-Spanish polemic about the kingdom's abuses in the American continent.[7] But, like the travelers' accounts discussed in the previous chapter, it was also popular. A printed account appeared in a 1567 collection of voyages called the *Warhafftige Beschreibunge aller theil der Welt*.[8] Later, Theodore de Bry included it in his hugely popular series on America, and the account was also published in standalone Latin and Dutch translations.[9] Political bent notwithstanding, readers expected descriptions of animals in their travel books—the

[7] On the German anti-Spanish propaganda of the mid sixteenth century, see Joachim Whaley, *Germany and the Holy Roman Empire*, volume 1 (Oxford: Oxford University Press, 2012), pp. 337-338. On the black legend more generally, see Charles Gibson, "Introduction," in *The Black Legend: Anti-Spanish Attitudes in the Old World and the New*, Charles Gibson, ed. (New York: Knopf, 1971), pp. 3-27. For a rethinking of the historiography of the black legend, see the essays in Víctor Navarro Brotóns and William Eamon, eds., *Más allá de la Leyenda Negra: España y la Revolución Científica/Beyond the Black Legend: Spain and the Scientific Revolution* (Valencia: Universidad de València, 2007).

[8] Sebastian Franck, *Warhafftige Beschreibunge aller theil der Welt, darinn nicht allein etliche alte Landschafften ... mit Fleiss beschrieben werden* (Frankfurt am Mayn: Bey Martin Lechler, 1567).

[9] For the book's publication history, see Dominguez, "Introduction," *The Conquest of the River Plate*.

stranger the better.[10] Europeans were also keenly interested in the animals of the New World, especially those that ended up in princely and scholarly collections, and because of his status as an eyewitness, Schmidt was in a privileged position to provide more much needed context.

From Schmidt's writing, we get a rich picture not only of the privations of daily life on this ill-fated expedition but also of the people, plants, and animals he encountered. The work's ethnographic descriptions were especially detailed and gave the reader a picture of tribes that would, over the course of the next few decades, be utterly decimated by wars and disease. And although its focus was not on animals, Schmidt did give some descriptions of a few notable creatures, though his descriptions were often short and perfunctory. He described "sheep the size of mules," "some rabbits that look just like a large rat, except that they don't have a tail," and "an animal that they call an *anta*, which has a head like a donkey, but with feet like those of a cow, with a grey hide, as thick as that of a buffalo."[11] He also described some fearsome and dangerous beasts, like "a large serpent, 25 feet long, as thick as a man, and splattered with black and yellow dots," which someone killed by a shot from a harquebus. "I myself," he reassured his readers, "have measured this very serpent, both lengthwise and breadthwise, so that I am telling you truly."[12] There was also a fish called a *yacare*, "which has such an impenetrable hide that it cannot be harmed by knife or arrow," but if it can be killed, "is very good to eat, especially its tail, which is the best part."[13] Though fearsome, it was common in the Indies, and he boasted that he had hunted and eaten more than three thousands of them.

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[10] See chapter 2 of this dissertation.
[11] Schmidt, *Conquest of the River Plate*, pp. 36, 39, and 50-51.
[12] Schmidt, *Conquest of the River Plate*, pp. 38-39.
[13] Schmidt, *Conquest of the River Plate*, pp. 73-74

Later, when he was back in Europe, he visited the collections of Albert V, Duke of Bavaria, and noticed that that collection had a preserved *yacare*. What was to Schmidt nothing more than a common tasty (if terrifying) source of nourishment was, in another context, a princely prize.[14]

Schmidt descriptions were often brief, and he continuously noted that there was so much more to write. In one particular example of huge fish that looked like a rock floating in the ocean which every so often "vomit[ed] up a great deal of water," he lamented that "much more ought to be said about it [and] about the many other fish that live in these regions and are a great marvel."[15] There were hat fish, sword fish, sawfish, and flying fish, and he constantly wrote that he did not do their strangeness justice in his account. As we saw in the previous chapter, travel writers were by and large enthusiastic but unsystematic recorders of the natural world. Schmidt hoped that other authors could take up the mantle of describing the animals because he, like so many other travelers, recognized their newness, even if their narratives could not always dedicate as much room to them, and nor did they have the philosophical bent to place them within more scholarly conceptions of the world.

Increasingly, Europeans began to see that the natural world was too varied and too wide reaching to be assessed by any one person in any one travel account. While travel literature often supplied Europe with precise zoological information, by the very nature of the enterprise, most of these books could not be far-ranging. Even people who could amass a great deal of information, as we saw in the previous chapter with Pietro Martire,

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[14] On Albert's collection, see Dirk Syndram, "Amassing Magnificence: The Role of the Kunstkammer in Princely Self-Representation," in *Making Marvels: Science and Splendor at the Courts of Europe*, Wolfram Koeppe, ed. (New Haven and London: Yale University Press, 2019), p. 37.
[15] Schmidt, *Conquest of the River Plate*, pp. 135-6. A similar passage about birds is on p. 103.

often simply did not write a systematic history of animals because it just was not the focus of their work. What was needed, some people thought, was to approach the New World in a more systematic and in-depth way, and to bring the model of ancient works of history, geography, and natural history to the new continent.

In the sixteenth century, two Spaniards did just that. This chapter looks at two people, Gonzalo Fernandez de Oviedo and José de Acosta, who expressly wrote not about their travel experiences but self-consciously took a different approach when writing about the history of the New World. Their books were among the first dedicated natural histories of the New World. This chapter will first discuss these two men and their respective works and look at the some of the novelties that these authors introduced into their own conception of natural history: Oviedo used images in a new way, and Acosta introduced a religious element into his scholarly pursuit. Next it will look at the ways in which these men wrote their work based on the model provided by Pliny the Elder's *Natural History*, but how they changed the model based on their own needs.[16] Here, I argue that although these men looked backwards to the natural histories of ancient times for models for their own works, this was not necessarily an obvious way of organizing zoological knowledge. Also, for all their reverence for the Plinian model, both men subtly tweaked the model of natural history to better reflect the needs of their own audience and their era and experimented with different sources of information and methods of describing.

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[16] Pliny, *Natural History*, vol. 3, tr. H. Rackham (Cambridge, MA and London: Harvard University Press, 1983). On late sixteenth century debates about the merits of Pliny's *Natural History* and its applicability to contemporary learning, see Charles G. Nauert, "Humanists, Scientists and Pliny: Changing Approaches to a Classical Author," *The American Historical Review* 84, no. 1 (1979): 72-85.

The Natural Histories: Oviedo and Acosta

Schmidt, in his narrative about his time in South America, was not focused on describing the region's animals in any systematic fashion. In this way, he was no different than the authors of the accounts described in the previous chapter. Rather, he explicitly argued that there was work still to be done in the description of New World fauna. Gonzalo Fernandez de Oviedo was one of the people who took up this call, but even he warned that the task was almost Sisyphean in its complexity. "What mortal understanding," he waxed in the dedicatory prologue to his final, unpublished work, the *General and Natural History of the Indies,* "could comprehend such a diversity of languages, habits, and customs among the people of the Indies? Such a variety of animals, from domestic to wild and savage? Such an unutterable multitude of trees? […] Such diversity of birds of prey and other raptors?" as existed in this new continent?[17] Despite these protestations on the near impossibility of the task, he nevertheless posited himself as the best person for the job and eventually did get a royal dispensation to dedicate his life to writing what he saw as the history of the New World.[18]

Oviedo was born in 1478, destined to a life of service to the Spanish crown. His father was a secretary to Henry IV of Castile, and Oviedo served as a page to various members of the Spanish nobility. At the court, he met Columbus a few years before his 1492 voyage, and he came to know many members of the Pinzon family, many of whom

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[17] "¿Quál ingenio mortal sabrá comprehender tanta diversidad de lenguas, de hábitos, de costumbres en los hombres destas Indias? Tanta variedad de animales, assi domésticos como salvajes y fieros? Tanta multitud innarrable de árboles, […] Tanta diversidad de aves de rapiña y de otras raleas?," Gonzalo Fernández de Oviedo y Valdés, *HGNI*, Tomo 1, parte 2, p. 2.

[18] See the dedicatory epistle to the *HGNI*, Tomo 1, parte 1 (Madrid: Real Academia de la Historia, 1851), p. cx. For an overview of Oviedo's life, see Juan Bautista de Avalle-Arce, "Gonzalo Fernández de Oviedo y Valdés: Chronicler of the Indies," in *The Hernando de Soto Expedition: History, Historiography, and "Discovery" in the Southeast*, Patricia Galloway, ed. (Lincoln, NE: University of Nebraska Press, 2005), pp. 369-379.

were influential in the early years of the conquest of the American continent. Many of Oviedo's friends accompanied Columbus on his third voyage in 1493, while Oviedo remained at court, rising in the ranks of the royal service, until he became the chamberlain to the heir apparent, prince Juan, until the latter's death in 1497. Without a patron, Oviedo traveled to Italy, where he studied painting and made the acquaintance of several Italians with whom he corresponded for the rest of his life. He remained somewhat peripatetic for the next few years, fighting in the Sicilian army, then later in the Spanish army against the French in 1503. Three years later, he caught the eye of king Ferdinand, who commissioned him to write and illustrate a genealogical history of the Spanish kings.[19]

Perhaps as a reward for a job well done for, in 1513 Oviedo was appointed the supervisor of the gold mines in Tierra Firme, a position he held until 1532, when the title passed to his son. He traveled back and forth between the New World and Spain with the king's share of the gold from the American mines, first for Ferdinand, then upon his death, for Charles V. Oviedo never gave up his literary pursuits, and during one of his stints in Spain in 1519, he published the chivalric romance *Don Claribalte*. That same year, Charles gave Oviedo a simultaneously more lucrative and less demanding position as a councilman and clerk of the court for the province of Panama, and commissioned him to write a history of the New World. In 1523, with an idea of how he wanted to proceed with book, he returned to Spain and remained there for three years, writing what he later published as the *De la Natural Hysotira de las Indias,* commonly referred to as the *Sumario*.

Oviedo wrote the *Sumario* entirely in Spain, and, as he continuously stressed, he also wrote it entirely from memory, away from his library and his notes. The latter were an

[19] This is the *Cathálago Real e Imperial de Castilla*, a huge manuscript work in Oviedo's own hand, with several sumptuous illustrations, now in the Biblioteca del Monasterio del Escorial, H-j-7.

ocean away in his Santo Domingo home. He also told his readers that this was only a small taste of what he had planned, and he had "already written more copiously in [his] papers and chronicle."[20] Moreover, in the dedicatory epistle, he emphasized that he had already completed a manuscript with all he "could find out about the things of the Indies."[21] As soon as he could return to his library, he promised that he would "send from there everything I have discovered and understood of this true history."[22] Re-energized by the publication of at least a part of his work, as soon as the *Sumario* was through the press in 1527, he returned to his home in Santo Domingo to see his family and attend to his official business, much neglected after his long writing retreat. 1530 saw him back in Spain, this time petitioning the king for a different arrangement. He had long held the lucrative sinecure of overseeing the court of the province of Panama, but he wanted that position to go to his son so that he could devote himself entirely to writing. Charles agreed, and appointed Oviedo the official chronicler of the New World, a position that, as we saw in the previous chapter, had been held by Pietro Martire. This was not a surprise, given that Oviedo had first petitioned the king for the job back when the latter died in 1526, and it was clear that his eye had been on that position for some time.[23]

Five years and one transatlantic round trip later, Oviedo was ready to publish a portion of his findings. This book, the *Hystoria General de las Indias, primera parte* was

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[20] "todo lo qual y otras muchas mas cosas […] muy mas copiosame[n]te yo te[n]go escripto y esta en los originales y Cronica q[ue] yo escrivo," Gonzalo Fernández de Oviedo y Valdés, *De La Natural Hystoria De Las Indias* (Toledo: Remón de Petras, 1526), f. 2^{r}. Hereafter, this material will be cited as the *Sumario*.
[21] "todo lo que he podido co[m]prehender y notar delas cosas de indias," Oviedo, *Sumario*, f. 2^{r}.
[22] "embiar desde alli todo lo que tengo penetrado y ente[n]dido desta verdadera historia," *Sumario*, f. 2^{v}.
[23] Kathleen Ann Myers, *Oviedo's Chronicle of America: A New History for a New World* (Austin: University of Texas Press, 2007), p. 19.

published by Seville's famed Cromberger press in 1535.[24] It was followed in 1547 by a second edition published in Salamanca. Touting itself as "newly printed, corrected, and emended," it was nevertheless essentially the same as the first edition, although it was given a new title, the *Coronica de las Indias*.[25] Though he corrected some small typographical errors, the *Cronica* had virtually the same text with no new information. Also, although he commissioned new woodcuts to replace those made for the *Primera Parte*, the *Cronica*'s images nevertheless depicted the same objects. Even as this edition was printing, he hoped to publish something new. He was determined to find a new press for the second part of the *Primera Parte*, but he found it difficult to obtain the necessary permits to have his work published.[26]

In his time as a colonial functionary, Oviedo managed to make quite a few enemies and not enough friends. Perhaps emboldened by his position as the official chronicler as bestowed upon him by the king, he never cultivated the right kinds of relationships with lower-level officials, and any books printed in Spain had to (thanks to a 1502 decree) have a license from the president of the royal tribunal in which it was printed. The penalties for printing without a license were both severe and enforced.[27] Oviedo's more powerful enemies, particularly Bartolomé de las Casas, were able to keep him from receiving one of

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[24] Gonzalo Fernández de Oviedo, *La Historia General de las Indias, Primera Parte* (Seville: Juan Cromberger, 1535).
[25] Gonzalo Fernández de Oviedo, *Cronica De Las Indias: La Hystoria General De Las Indias Agora Nueuamente Impressa Corregida Y Emendada* (Salamanca: Juan de Junta, 1547). In most copies, a separate line of text was added to the title page, "y con la conquista del Peru," and it was bundled with the second edition of *Verdadera relación de la conquista del Peru* by Francisco de Xerez.
[26] Daymond Turner, "The Aborted First Printing of the Second Part of Oviedo's 'General and Natural History of the Indies'," *Huntington Library Quarterly* 46, no. 2 (1983): 105-125.
[27] Frederick John Norton, *Printing in Spain, 1501-1520* (Cambridge: Cambridge University Press, 1996), pp. 119-120.

these necessary licenses, thus blocking its publication.[28] Frustrated after three years of getting nowhere with the permits, Oviedo returned to Santo Domingo to continue with the rest of the books of his *Historia Natural*, hoping that time would mellow his personal predicament. This proved not to be the case, however. Upon his subsequent (and last) return to Spain, he found that Charles, who had granted him the position of official chronicler, had abdicated. By then, nearing 80, Oviedo did not have the time, desire, or energy to cultivate a new relationship with a third Spanish king, nor was it any easier for him to secure the necessary permits to print the text he already had. Before his death, he managed to arrange for the final book in his 20-volume opus to be printed in Valladolid, but in the summer of 1557, he died with the majority of the manuscript still unpublished.[29]

While historians often point to Oviedo as the first person to investigate the natural world in a systematic way, he was not the first, nor would he be the last. The Jesuit José de Acosta embarked on a project quite similar to Oviedo's, though both his impetus for writing and his finished product were quite different. Acosta was born in 1540 to a prosperous merchant family in Medina del Campo, and unlike Oviedo's early life at the Spanish court, Acosta chose the religious life. After a short period of time studying Latin grammar, he entered the Society of Jesus at the age of 11. At the end of his novitiate, he began teaching grammar and rhetoric in his hometown, but his skills in both Latin and pedagogy were in high demand, so he traveled to various Jesuit colleges throughout Spain

[28] For the feud between Oviedo and De Las Casas, see Rolena Adorno, "Oviedo and Las Casas," in *Colonial Latin American Literature: A Very Short Introduction* (Oxford: Oxford University Press, 2011), pp. 21-34. See also De Las Casas's views on Oviedo in Bartolomé de Las Casas, *Historia de las Indias*, Tomo III (Mexico City: Fondo de Cultura Económica, 1965), pp. 332-333.
[29] On the publication history, see Antonio Gerbi, *Nature and the New World: From Columbus to Gonzalo Fernández de Oviedo*, Jeremy Moyle, tr. (Pittsburgh: University of Pittsburg Press, 1985), pp. 129-144.

and Portugal to teach.[30] In 1559, he entered the university at Alcalá de Henares. That university was founded under the patronage of cardinal Francisco Jiménez de Cisneros with the expectation that it would be a center of learning that applied humanist principles to theology and was particularly popular with young Jesuits.[31] Despite Cisnero's aspiration, the late sixteenth century education at Alcalá remained quite traditional, and Acosta's education was heavily Aristotelian, with supplemental classes on Thomas Aquinas.[32] It was at Alcalá that he first asked his superiors to send him to the Indies for missionary work. After several letters to both the Superior General Francisco de Borja and the head of the Jesuits in Rome, he finally got his wish in 1571, when he was assigned to preach and teach theology in Peru.[33]

In 1572, Acosta arrived in a Peru in turmoil. The year before, Philip II appointed Francisco de Toledo as Viceroy of the region specifically to put down Inca rebellion against Spanish rule. Toledo was ruthless in his mandate, and his war against the native peoples of the Spanish viceroyalty of Peru culminated in the public execution of the last monarch of the Neo-Incan state.[34] Toledo welcomed Acosta, and saw in the fledgling Jesuit settlement in Peru a way to further his plan to place indigenous people into settlements called *reducciones* in order to more effectively exert religious and economic

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[30] Claudio M. Burgaleta, *José de Acosta, S.J. (1540-1600): His Life and Thought* (Chicago: Loyola University Press, 1999), pp. 9-15.
[31] George M. Addy, "Alcalá Before Reform: The Decadence of a Spanish University," *Hispanic American Historical Review* 48, no, 4 (1968), p. 651; Marcel Bataillon, *Erasmo y España: estudios sobre la historia espiritual del siglo XVI*, Antonio Alatorre, tr. (Mexico City: Fondo de Cultura Económica, 1966), pp. 10-20.
[32] Burgaleta, *José de Acosta*, pp. 17-19.
[33] Burgaleta, *José de Acosta*, p. 30.
[34] Charles F. Walker, *The Tupac Amaru Rebellion* (Cambridge, MA: Harvard University Press, 2014).

control over them.[35] Acosta's arrival coincided with the start of this forcible resettlement program, and Toledo called upon members of the order to accompany his visitation of the viceroyalty. In 1573, Acosta and several of his Jesuit brothers were sent to meet the viceroy while he was in what is now Bolivia. That was the start of a year and a half long trip for Acosta, where he traveled extensively and learned not only about the indigenous people and their culture, but also about the natural world that was in many respects different from what he had known in Europe. After his eighteen-month visitation, he settled down in Lima, where he began teaching as a professor of theology in the Jesuit school in Lima.[36]

While in Lima, Acosta began writing. Between 1576 and 1577, he wrote the *De Procuranda Indorum Salute*, a treatise on the evangelization of Amerindians and the obstacles that stood in the way of that goal.[37] In 1581, he began another book, the *De Natura Novi Orbis,* a book about the geography and people of the Andean region. Though the first was explicitly religious in its aims, the second, ostensibly about the natural world, was also in the service of evangelization. *De Natura* represented the intersection of theology and philosophy, and Acosta's attempt to grapple with the fact that Aristotle, whom he had studied at Alcalá, was so often wrong in the case of the New World.[38] The *De Natura*

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[35] Jeremy Ravi Mumford, *Vertical Empire: The General Resettlement of Indians in the Colonial Andes* (Durham, NC: Duke University Press, 2012). Toledo would later sour on Jesuit involvement, and later tensions emerged over the state's attempt to control religious affairs in the American continent.
[36] On Acosta's travels, see Burgaleta, *José de Acosta*, pp. 36-39.
[37] On the objectives of *De procuranda*, see Gregory J. Shepherd, *José de Acosta's De procuranda Indorum Salute: A Call for Evangelical Reforms in Colonial Peru* (New York: Peter Lang, 2014).
[38] For Acosta's grappling with Scholastic authority, see James Romm, "New World and '*novos orbos*': Seneca in the Renaissance Debate over Ancient Knowledge of the Americas," in *European Images of the Americas and the Classical Tradition*, Wolfgang Haase and Reinhold Meyer, eds. (Berlin and New York: Walter de Gruyter, 1994), pp. 107-113.

focused particularly on cosmology and geography, then the mistaken belief of ancient authors like Aristotle that the Torrid Zone was uninhabitable.[39] His central motivation for writing, however, was not to pick a fight with authorities whose books made up the majority of the curriculum in his time at Alcalá, but to prove wrong those of his contemporaries who believed that the Amerindians were incapable of evangelization.[40] Acosta made clear in *De Natura* that, while there was "no sure way to know the first origins" of the native people, it was probable that people traveled to the New World via a land bridge or by crossing a relatively small body of water.[41] He was clear to stress that, however they arrived to the New World, the people who would eventually come to inhabit the New World "departed from a civilized and moral region" but were capable of returning to it.[42] That meant, he argued, that even though they may have forgotten these virtues after generations in the Americas, they were still capable of relearning them. *De Natura*, like *De Procuranda*, was written for theological ends. Acosta argued against those who presented the American continent and its inhabitants as inherently different from Europe and Europeans. He argued that, in its physical arrangement, the American continent was like Europe, and that its people and its animals originally came from the

[39] On early modern debates about the Torrid Zone, see Nicolás Wey Gómez, *The Tropics of Empire: Why Columbus Sailed South to the Indies* (Cambridge, MA: The MIT Press, 2008).
[40] This was also the central concern of *De Procuranda*. Acosta adopted a similar position to Bartolomé de las Casas, and he also thought that the failure of evangelization lay not in the inherent qualities of the people of the New World, but in the excesses and abuses of the Spanish conquest. For more on the question of evangelization of Amerindians in early modern Spain, see Anthony Pagden, *The Fall of Natural Man: The American Indian and the Origins of Comparative Ethnology* (Cambridge: Cambridge University Press, 1986); Lewis Hanke, *All Mankind Is One; A Study of the Disputation between Bartolome De Las Casas and Juan Ginés De Sepúlveda in 1550 on the Intellectual and Religious Capacity of the American Indians* (DeKalb, IL: Northern Illinois University Press, 1994).
[41] "… prima origo indorum certo sciri non possit," José de Acosta, *De Natura Novi Orbis Libri Duo et De Promulgatione Evangelii apud Barbaros* (Salamanca: Foquel, 1589), p. 67.
[42] "ex culta & bene morata republic profecti essent," Acosta, *De Natura,* p. 68.

Old World.[43] This meant that the land was not monstrous, and its inhabitants were capable of becoming Christians, therefore, the Jesuit program of evangelization in the New World was a worthwhile enterprise and one that ought to be supported by the Spanish state.[44]

Acosta sent both treatises to Claudio Acquaviva, the Superior General of the Jesuits, who suggested that they be published in Spain.[45] After 14 years in Peru, Acosta (like Oviedo) made the journey back to his homeland to see his books through the press. Unlike Oviedo, however, Acosta had little trouble getting his works through Spanish censors. After complying with the examiner's wishes that he remove most mentions of Spanish cruelty, he received his royal license, and the first edition came out in Salamanca in 1588. Another edition came out in that city a year later, followed by printings in Cologne (1596), Lyon (1670), and Manila (1858).[46] Once in Spain, he also expanded *De Natura* to include more about what he learned in the Americas. He also made the decision to publish the expanded work not in Latin, but in Spanish, as the *Historia Natural y Moral de las Indias*.[47] Throughout the late fifteenth and early sixteenth centuries, the book was translated into Latin, Italian, English, French, German, and Dutch, and was one of the most widely read books of the sixteenth century.[48]

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[43] On the movement of animals across a land bridge, see Acosta, *De Natura*, pp. 58-61.
[44] On Acosta's theological motivations, see Walter Mignolo, "Introduction to José De Acosta's *Historia Natural y Moral de las Indias*," in José de Acosta, *Natural and Moral History of the Indies*, ed. Jane E. Mangan, tr. Frances López-Morillas (Durham and London: Duke University Press, 2002), p. xxi; Burgaleta, *José de Acosta*, pp. 87-116
[45] María de la Luz Ayala, "La historia natural en el siglo XVI: Oviedo, Acosta y Hernández," *Estudios del Hombre* 20 (2005), p. 25.
[46] Ayala, "La historia natural," p. 26.
[47] José de Acosta, *Historia natural y moral de las Indias* (Seville: Juan de León, 1590).
[48] Walter D. Mignolo, *The Darker Side of the Renaissance: Literacy, Territoriality, & Colonization* (Ann Arbor: Michigan University Press, 1995), p. 31. On the translation history, see Clements R. Markham, "Introduction," in Joseph de Acosta, *The Natural & Moral History of the Indies*, vol. I, tr. Edward Grimston, ed. Clements Markham (London: Hakluyt Society, 1880), pp. xiii-xv.

Acosta had a different end than Oviedo in writing and a different style. In contrast to Oviedo's encyclopedism and debt to the Plinian tradition, Acosta had a far more Aristotelian approach. In particular, he sought to define the causes of the natural phenomena he experienced in his time in Peru. Throughout the book, Acosta stressed that he tried to understand the "causes and reasons of [the] novelties and wonders of nature," and took an explicitly Aristotelian natural philosophical approach to natural history.[49] While Oviedo and Acosta were by no means the only authors of natural histories in the sixteenth century, nor were they the only Spaniards who dedicated their written works to understanding the natural world, they nevertheless represent a shift away from the travel accounts of the past. Both men, in their respective works, attempted to define what it meant to write a work of natural history. They had certain epistemological objectives that fostered a particular kind of natural history, one that was tied to ancient models, but nevertheless redefined what was relevant for the discipline.

Writing in an age of innumerable eyewitnesses:

Once Oviedo was named the royal chronicler of the Indies, the way he wrote changed. He became, as historian Kathleen Myers argued, more self-reflexive about the methodological difficulties of writing the history of the region. His position as a participant-observer influenced his development of a new historical method for a new world, and his work had repercussions that reverberated beyond the bounds of history. As Myers and others have pointed out, he stressed that information about the Indies was best

[49] "…las causas y razon de tales novedades y estrañezas de naturaleza," Acosta, *Historia natural*, p. 9. On Acosta's Aristotlianism, see Enrique Alvarez López, "La Filosofía Natural en el Padre José de Acosta," *Revista de Indias* 4 (1943): 305-322; Thayne R. Ford, "Stranger in a Foreign Land: José de Acosta's Scientific Realizations in Sixteenth Century Peru," *The Sixteenth Century Journal* 29, no. 1 (1998), pp. 22-24.

(and only) to be learned through personal experience.[50] He also knew that this claim to expertise could also mitigate against any criticism he might receive, especially if the material he presented did not conform to what Europeans understood to be true about the natural world. "Since readers must listen to me from so far away," he wrote in the preface to the *Primera Parte*, "they cannot judge me without having seen this land where I live and about which I write. Let it be enough that I write from here, in an age of innumerable eyewitnesses."[51] Others might criticize his work, he argued, but these criticisms could only come from those who had never experienced anything in the New World for themselves. Moreover, readers did not even need to take Oviedo's word for it. There were plenty of people in the New World who wrote about their experiences. In this insistence on autopsia, therefore, he did not differ much from the travel writers whose work most closely resembled his own.

Like his predecessors, he relied on some of the same conventions that gave travel writers their credibility. For example, he used the trope of privation as a source of legitimacy and argued that readers should believe him because of the hardships he bore.[52] "Let the reader be satisfied," he wrote in the finished manuscript of the *Historia General y Natural*,

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[50] Myers, *Chronicle of America*, pp. 8, 26-41. See also Félix Alvaro Bolaños, "La crónica de Indias de Fernández de Oviedo: Historia de lo general y natural, u obra didáctica?," *Revista de Estudios Hispánicos* 25, no. 3 (1991): 15-33; Sarah H. Beckjord, *Territories of History: Humanism, Rhetoric, and the Historical Imagination in the Early Chronicles of Spanish America* (University Park: Penn State University Press, 2007), pp. 128-162.

[51] "y pues los letores me ha[n] de escuchar desde tan lexos no me juzgue[n] sin ver esta ti[er]ra donde estoy y de quien tracto y q[ue] les baste q[ue] desde ella escribo en t[iem]po de innumerables testigos de vista," Oviedo, *Primera Parte*, f. 4v.

[52] Beau Riffenburgh, *The Myth of the Explorer: The Press, Sensationalism, and Geographical Discovery* (Oxford: Oxford University Press, 1993); Carl Thompson, *The Suffering Traveller and the Romantic Imagination* (Oxford: Clarendon Press, 2007), especially pp. 71-73; J.C. Davis, "Going Nowhere: Travelling to, Through, and from Utopia," *Utopian Studies* 19, no. 1 (2008), p. 9.

> with what I have seen and experienced with much danger to myself. Let him enjoy the words and suffer none of the dangers and let him read it in his own home him without suffering the hunger and thirst, heat and cold, and from his own homeland, without braving the storms in the sea, nor the misfortunes that occur on land.[53]

Personal suffering was a great legitimator, but so was eye-witnessing. If he proposed something particularly odd, he used his status as an eyewitness to bolster his argument, as when he claimed that Amerindian skulls were four times thicker than those of Christians. This was true, he assured his readers, because he had seen many a sword broken when an unwary Spaniard tried to cleave an Amerindian in two and get a broken sword for his pains.[54] It was not just his own testimony either. When he wrote about the incredibly tiny size of mosquito-birds, he assured the king that "I would not dare speak of it, except that besides me, there are other eyewitnesses in your court" that could back him up.[55]

However much Oviedo relied on some of the same conventions as travel writers, he nevertheless saw himself as doing something different from his predecessors, especially from Pietro Martire, from whom he inherited his position. Contra Martire (whom he constantly referenced, but rarely mentioned by name), Oviedo believed that one should write history based on firsthand witnessing, and that he was, by virtue of living in the New World, much better positioned for this than anyone in Europe. Early in the *Historia*, he made clear that a person "who speaks of things that he heard speaks with less authority than he who saw them," something which, he reminded his readers, was not merely his own caprice, but something Pope Gregory wrote in his commentaries on the book of

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[53] "Conténtese el lector con que lo que he visto y experimentado con muchos peligros, lo goza el y sabe sin ninguno; y que lo puede leer, sin que padezca tanta hambre y sed, y calor, y frío, con otras innumerables trabajos desde su patria, sin adventurarse a las tormentas de la mar, ni a las desventuras que por acá de padezcan en la tierra; sino que para su pasatiempo y descanso haya yo nacido, y peregrinado visto estas | que se pueden decir tales," Oviedo, *HGNI,* Vol. 1, pp. 5-6.
[54] Oviedo, *Sumario*, f. 18^{r}.
[55] Oviedo, *Sumario*, f. 29^{v}.

Job.[56] "I mention this," Oviedo continued, "because of those [people] who have written about the Indies from Spain based on hearsay." This, he argued, was unacceptable in a historian, but he found himself having to defend his own position on this very point. In the *Historia*, he wrote of events that had occurred in Spain, "although I live here [in the Indies]."[57] To explain this apparent contradiction, he quickly asserted that he had been in Spain at that time, so he saw for himself the things that transpired. He had to make the same claim in his *Sumario*, especially in his discussion of the natural history. What he wrote about animals, he constantly stressed that while he was not writing about the New World from the New World itself, he was writing "from memory" of his time there.[58]

Later in the work, Oviedo felt more comfortable referencing his predecessor directly. "The *protonotario* Pieto Martire, in his chronicle or *Decades*, says that he wrote these things of the Indies," Oviedo told his readers, but he wrote them "without having seen them."[59] In this case, he took issue with something Martire said about the terrible scourge of naval shipworm, a pest that could eat through wood, riddling it full of holes and leaving destruction in its wake.[60] Perhaps because of his habit (conscious or not) of making the New World seem more wondrous than it was, Martire wrote that there were certain trees in the West Indies that, by their bitterness, were not affected by shipworm.

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[56] "Con menor autoridad enseña el que habla las cosas que oyó, quel que diçe que las vio. Esto dice San Gregorio sobre los capitulos catorce e quince de Job," Oviedo, *HGNI,* vol. 1, p. 28.
[57] "mas yo no no lo traigo aquí a consecuencia solamente por los que aquestas cosas de indias las han escrito desde España por oydas, sino dígolo porque hablaré aquí de las de España desde las Indias. […] aunque vivo acá [in the Indias], ví lo que acaesçio acullá [in Spain]," Oviedo, *Primera Parte*, f. 9^{v}.
[58] "de memoria," Oviedo, *Sumario*, f. 4^{v}.
[59] "Dice el protonotario Pedro Mártir, en la crónica o Décadas que escribió destas cosas de Indias (sin las ver)," Oviedo, *HGNI*, vol. 1, p. 457.
[60] Shipworm, it seems, was not indigenous to the Americas, so it is possible that this was true at the time that Martire wrote it, see, Adam Sundberg, "Molluscan Explosion: The Dutch Shipworm Epidemic of the 1730s," *Arcadia* no. 14 (2015).

"This would be most fortuitous," Oviedo agreed, "if it were true."[61] However, he had been in these lands that Martire mentioned, and there were no such trees. "Because there is so much of it [shipworm], and it is so damaging to ships and buildings," he continued, "if there were such a wood, it would be very well known, and it would be held in high esteem, and it could not have fallen from memory if there had once existed such a tree." This was, he concluded, "a fable, and not true."[62] It was not, he argued, that Martire had any ill will towards the truth. Quite the opposite, in fact. Oviedo wrote that his predecessor "wanted to write the truth and would have done so *if he had been faithfully informed*. However, since he wrote about what he did not see, it does not surprise me that his *Decades* have many errors."[63] Oviedo's appeal to the primacy of one's own senses was not novel—as we saw in the previous chapter, it was something to which even Martire appealed.[64] Nevertheless, Oviedo argued that his version of autopsia was distinctive.

In the preface to the king in the *Sumario*, Oviedo argued that "although here [in Spain] people have written and eyewitnesses have talked [about the things of the West Indies], these will not be written as accurately as they will be written of here."[65] It was true, he conceded, that others who had visited the Americas

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[61] "Lo cual sería muy provechoso si fuese verdad," Oviedo, *HGNI*, vol. 1, p. 457.
[62] "yo he estado en aquella tierra que él dice e no hay tales árboles, ni hasta agora se conoscen en estas partes maderas ni árbol alguno que esté exento, o se pueda decir libre de la broma; porque hay tanta y es tan dañosa para los navíos y edeficios, que si tal leño hobiese, sería muy conoscido e le ternían en mucho, e no se podría caer de la memoria si una vez tal árbol se supiese, ni sería poco ejercitado; pero yo lo tengo por fábula e no cierto," Oviedo, *HGNI*, vol. 1, pp. 457-458.
[63] "…yo creo que él deseaba escrebir lo cierto, si fielmente fuera informado; mas como habló en lo que no vido, no me maravillo que sus decadas padezcan muchos defetos," Oviedo, *HGNI*, vol. 1, p. 458, emphasis mine.
[64] Anthony Pagden looked at how Oviedo and others appealed to the authority of eye witnessing in *European Encounters with the New World: From Renaissance to Romanticism* (New Haven: Yale University Press, 1993).
[65] "aun q[ue] acá de aya escripto y testigos de vista lo ayan dicho no sera tan apuntadamente en todas estas cosas como aqui se dira," Oviedo, *Sumario*, f. 2v.

> may have spoken the truth about some or all of these things, it is possible that the things of this nature [natural history] may have fallen from their memory because they observe them with less attention than would people like me, who, by natural inclination, have desired to learn of them, and because of their work, have observed them firsthand.[66]

Anyone who may have "come to these parts for business or for other reasons," was not, in Oviedo's eyes, capable of writing good history, and certainly not good natural history.[67] In other words, eye-witnessing, or autopsia, was not enough. One also needed a "desire to learn," and an inclination that allowed a person not just to describe, but to come to a deeper understanding of the things they encountered.

History was, for Oviedo, a pursuit to be taken seriously, and one whose boundaries and parameters needed to be redrawn after the rush of uncritical volumes that were the result of the discovery of the New World. He argued that writing history ought to be a full-time occupation in order to do it well. It was for this reason that he petitioned the king for the position of chronicler. Though he learned much about the American continent while working as an official assayer, when it came time to write, he felt he needed to dedicate all his faculties to writing. His official duties took him away from this task, so asked the king for a change in occupation.[68] He was successful, and by the time he wrote the second iteration of the *Hıstoria* in 1535, he proudly stated that he earned his living solely from his writings.[69]

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[66] "[A]un q[ue] en algunas ellas o en todas aya[n] hablado la verdad los q[ue] a estas partes vienen a negociar o entender en otras cosas q[ue] de mas interesse le puede[n] ser los q[ua]les quita[n] de la memoria las cosas de esta calidad porq[ue] con menos ate[n]cion las miran y considera[n] q[ue] el que por natural inclinación como yo ha deseado saberlas y por la obra ha puesto ojos en ellas," Oviedo, *Sumario*, f. 2ᵛ. Though this exact phrase was cut out of the final manuscript, he still argued that he was a person "with a natural inclination to inquire ("con natural inclinacion de inquerir") Oviedo, *HGNI,* vol. 1, p. 113.
[67] "vienen a negociar o entender en otras cosas," Oviedo, *Sumario*, f. 2ᵛ.
[68] Myers, *Oviedo's Chronicle of America*, p. 19.
[69] Oviedo, *Primera Parte*, f. 4ᵛ.

As official chronicler, Oviedo hoped to reshape the model for how people wrote history. He especially disapproved of how the *Casa de Contratación* ordered its chroniclers to treat the subject. For Oviedo, there was no place in history for accounts of personal travel or cosmography and navigation. He *did* recognize that cosmography and history shared some common elements in that both were experiential endeavors. As he wrote in his manuscript, cosmography was something that

> cannot be learned in Salamanca, or Bologna, or Paris, but only in the cathedra of the binnacle, which is the place where the compass needle is kept. […] I say that navigation requires more than just words. […] Even if one studies cosmography and knows it better than Ptolemy, he will not know, even with all the words ever written, how to navigate until he does it.[70]

So, though he recognized that the legitimacy of both a cosmographer and a historian rested on firsthand experiences, this did not mean, as the *Casa* believed, that the two disciplines should be treated in the same manner. He instead concluded that it was "better to leave these matters to the navigation charts and the new cosmography, […] it is not necessary here."[71] He viewed *natural* history differently, however. He understood that while autopsia was important and empirical investigation did provide information about animals, he saw natural history (as opposed to something like cosmography) as a fundamentally textual endeavor.

Oviedo positioned himself as uniquely positioned to write natural history because unlike cosmography, which could not be learned in a formal setting, natural history was

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[70] "Esto que he dicho no se puede aprender en Salamanca, ni en Boloña, ni en Paris, sino en la cátedra de la gisola, que es aquel lugar donde va puesta el aguja de navegar. [...] [D]igo yo que otra cosa quiere tambien la navegacion que palabras [...] porque uno estudia la cosmographia e la sepa muy mejor que Tholomeo, no sabrá, con quantas palabras están escriptas, navegar hasta que lo use," Oviedo, *HGNI*, Vol. 1, pp. 39-40. He also argued that medicine was a wholly empirical endeavor as well. I relied on Nina Scott's translation of the word gisola, for more, see Nina M. Scott, "Appendix C: Translator's Note," in *Fernández De Oviedo's Chronicle of America*, p. 144.

[71] "Todo esto es mejor remitirlo alas cartas de navegar y cosmographia nueva [...] aq[ue]sto no es menester para aqui," Oviedo, *Sumario*, f. 3^{v}.

informed by both empirical and theoretical learning. Moreover, he was committed to a version of history that both included a natural history that was developed with experiential methods and required a referent to an ancient model of doing history. While he did often criticize Pliny, those criticisms were directed at particular matters of fact where what the ancient author wrote did not conform to Oviedo's experience. "But why do I need Pliny pr any other ancient author," he once asked, "to prove the things we see every day and are evident to everyone?"[72] Crucially, however, these denunciations were for the *conclusions* Pliny reached about the natural world, not his model. "As I have said," he wrote in the introduction to the second book of the *Historia General y* Natura, "in these [books], I intend to imitate [Pliny] in every way I can."[73] Overall, Oviedo saw Pliny's example as the best way to write history.

Following other ancient precedents, Oviedo made no separation between natural and general history. Oviedo's first published work about the Indies was the 1526 *De la Natural Hystoria de las Indias*, followed by the 1535 *Hystoria General de las Indias*, and what was to be his final work, the unpublished *Historia Natural y General de India.* In all three, the titles themselves speak to this understanding that history was an expansive category. Daymond Turner reconstructed Oviedo's library based on his many citations and determined that he owned at least 118 volumes, and likely more, arguing that by his death, Oviedo likely had the largest private library in the New World.[74] The authority whom he

[72] "Mas, para qué quiero yo probar con Plinio ni otro antiguo auctor las cosas que cada dia vemos é son notorias á todos los hombres?" Oviedo, *HGNI*, vol. 1, p. 437.
[73] "… en los quales [libros] como he dicho en todo quanto le pudiere imitar [a Plinio], entiendo façerlo," Oviedo, *HGNI*, vol. 1, p. 10.
[74] Daymond Turner, "Biblioteca Ovetense: A Speculative Reconstruction of the Library of the First Chronicler of the Indies," *The Papers of the Bibliographical Society of America* 57, no. 2 (1963): 161-77.

cited the most was of course, Pliny, followed by Isidore of Seville.[75] Also, he did likely own Aristotle's *Meteorology* and *Ethics*, though he had not read the former's *History of Animals*.[76] He had read widely, if not comprehensively, in ancient literature, and used these works not only to give his content about the New World context, but also an overarching structure. As Gianna Pomata has argued in the context of medicine, the sixteenth century was a "period of dramatic change in *historia's* meaning."[77] *Historia* was also, as Brian Ogilvie has pointed out in an article in the same volume, "available as a category for the study of animals and plants, had humanists wished to use it. But they did not."[78] Ogilvie's actors not only found Pliny incorrect in many matters, but they also found his model too expansive and all-encompassing.[79] By contrast, Oviedo actively embraced both Pliny *and* an expanded notion of *historia* as his model. For him, describing the deeds of the past and describing the geography, flora, and fauna of the present were part of the same endeavor. However, though the structure owed much to its Roman predecessor, Oviedo's *Historia General y Natural* nevertheless differed in some respects from Pliny's model, especially when Oviedo was confronted with American animals.

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[75] According to de las Casas (and Turner agrees), Oviedo's copy of Pliny's *Natural History* was an Italian translation, likely Cristoforo Landino's 1489 *Historia Naturale Di C. Plinio Secondo*, Turner, "Biblioteca Ovetense," p. 158.
[76] Turner, "Biblioteca Ovetense," p. 159. For Aristotle's *Historia Animalium* and sixteenth century naturalists, see Walter Pagel, *William Harvey's Biological Ideas; Selected Aspects and Historical Background* (Basel, New York: Karger, 1967).
[77] Gianna Pomata, "Praxis Historialis: The Uses of Historia in Early Modern Medicine," in *Historia: Empiricism and Erudition in Early Modern Europe*, Gianna Pomata and Nancy G. Siraisi, eds. (Cambridge, MA: The MIT Press, 2005), p. 105.
[78] Brian W. Ogilvie, "Natural History, Ethics, and Physico-Theology," in *Historia*, p. 77.
[79] Ogilvie, "Natural History, Ethics, and Physico-Theology," in *Historia*, pp. 77-78. See also Brian Ogilvie, *The Science of Describing: Natural History in Renaissance Europe* (Chicago: University of Chicago Press, 2008), pp. 30-34.

"What mortal understanding could comprehend such a diversity?": Animals in Oviedo's *Historia*

With each subsequent iteration of the *Historia*—the 1526 *Sumario*, the 1535 *Primera Parte*, the 1546 reissue of the same, and finally the completed manuscript—the sections about the animals of the Indies grew more voluminous. This was a consequences of not only the passage of time—Oviedo observed more things in the years that separated his first publication from his last— but also the because he "experienced (*experimentado*) with greater attention to those things which were particularly important to see and understand."[80] His work, he continued, expanded with the inclusion of "other amazing and completely new things, which I could not have written then, not having seen them or known about them."[81] The extra time he had to observe and experience correlated to the expanding of his textual output. The *Sumario* had 49 short chapters on individual animals or groupings of similar animals (rabbits and hares, for example, were treated in the same chapter).[82] The *Primera Parte*, which was not a re-issue so much as an expansion of the earlier work, did not contain information about any of the animals described in the previous work. Instead, Oviedo added 35 new—and more detailed—chapters. These were arranged, foreshadowing the final grouping in the manuscript he intended to publish, into four books: on animals (by which he meant quadrupeds), water animals, birds, and

[80] "[Y]o hé visto mucho mas de lo que hasta entonçes sabia destas materias en diez años que han pasado desede que aquello se escribió; experimentado con mas atençion lo que a este efecto convenia mas particularmente ver y entender," Oviedo, *HGNI*, vol. 1, p. 115. On the shift in the concept of observation and experience in the early modern period, see Peter Dear, "The Meanings of Experience," in *The Cambridge History of Science, Volume 3: Early Modern Science*, Lorraine Daston and Katherine Park, eds. (Cambridge: Cambridge University Press, 2006), pp. 106-131.

[81] "Y demas desto, es de notar qur todo lo que aquel reportorio o sumario contiene, avrá en este tractado y sus partes acreçientado, e otras cosas grandes e muy nuevas, de que alli no podia yo hacer memoria, por no averlas visto, ni sabido," Oviedo, *HGNI*, Vol. 1, p. 115.

[82] Although the animals were not differentiated into different books, as they would later be, they were broadly classified into three basic groupings: quadrupeds, birds, and vermin (a category that contained everything from insects to iguanas).

insects. The animal section in the manuscript for the *Historia Natural* was even larger. It not only combined the information published in the *Sumario* and the *Primera Parte*, but it also added 26 entirely new chapters, and greatly expanded on the previously published ones.

In these chapters, he tried to firmly establish not only his work, but also New World animals, as having ancient counterparts. He began the *Sumario* with a chapter on the tiger in a way that resembles what William Ashworth described as emblematic natural history, a mode which he argued characterized most natural history of the era.[83] "The tiger," Oviedo wrote,

> is an animal that, according to what the ancients have written, is the fastest of all terrestrial animals. *Tiguer* [sic] in Greek means arrow, and just as the river Tigris was so called for its swiftness. The first Spaniards who saw these tigers in Tierra Firme called them this.[84]

More time and reflection did not dampen his enthusiasm for ancient texts. Quite the opposite, in fact. When he prepared the manuscript for the *Historia Natural*, he once again had access to his library, and used it to include even *more* ancient authorities to his modern text. Citing Isidore, he wrote "The *tigris* is so called because of its rapid flight, for this is what the Persians and Medes call an arrow. It is a beast distinguished by varied markings, amazing in its strength and speed. The river Tigris is called after the name of the animal,

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[83] William B. Ashworth, Jr., "Natural History and the Emblematic World View," in *Reappraisals of the Scientific Revolution*, David C. Lindberg and Robert S. Westman, eds. (Cambridge: Cambridge University Press, 1991), pp. 303-332; and Ashworth, "Emblematic Natural History of the Renaissance," in *Cultures of Natural History*, Nicholas Jardine, James A. Secord, E. C. Spary, eds. (Cambridge: Cambridge University Press, 1996), pp. 17-37.

[84] "El tigre es animal que segu[n] los antiguos es el mas velocissimo delos animales terrestres. *Tiguer* en griego quiere dezir saeta assi por la velocidad d[e]l rio Tigris se le dio este no[m]bre. Los primeros españoles q[ue] vireo[n] estos Tigres in tierra firme llamaro[n] assi a estos animales," Oviedo, *Sumario*, f. xix^{r}.

because it is the most rapid of all rivers."[85] Oviedo also took the opportunity to correct some of his earlier errors about ancient tigrine facts, and cited two more authorities who did not appear in the *Sumario*: Justinian, on the Tigris River; and Pliny, "who wrote that the panther and the tiger, on account of the variety of its colors and diversity of its spots, are different from all other types of animals, because all other beasts are only of one color, according to its species."[86] In adding these references, he connected this animal to a larger conversation about natural history, one that had begun centuries ago, and which flourished in the sixteenth century.

Oviedo also contributed some additional information to the larger project of tigrine natural history. In that era, detailing an animal's name in various languages was as important to natural history as describing its physical characteristics.[87] In order to contribute to that conversation, he noted that the inhabitants of the region called it *ochi*. This was the animal's name in Taíno, a language widely spoken in the parts of the Caribbean where Oviedo spent much of his time.[88] He also included the indigenous names of other fauna and flora, nearly all in Taíno.[89] Much like his enumeration of what ancient

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[85] Translation of the *Etymologies* taken from Isidore of Seville, *The Etymologies of Isidore of Seville*, ed. Stephen A. Barney et al. (New York: Cambridge University Press, 2006), p. 251. This was copied in Oviedo, *HGNI* vol. 1, p. 401. Although the original autograph manuscript of this portion of the *Historia General y Natural* no longer exists, there is a copy of it in the Real Academia de Historia in Madrid (Muñoz A/34). Oviedo cited this in the original Latin; presumably he would have wanted it to remain that way in the printed version. The Latin text does have some errors in it (*vocatur* for *vocata*, *velocem* for *volucrem*), though it is impossible to know if this was Oviedo's error, or the later copyist.

[86] "Plinio dice que la pantera e el tigre, por la variedad de las colores e diversas manchas son cuasi diferentes de todos los otros animales, porque las otras fieras han una sola color, segund su especie," Oviedo, *HGNI*, vol 1, p. 401.

[87] Ashworth, "Natural History and the Emblematic Worldview," pp. 305-306.

[88] Juan Clemente Zamora Munné, *Indigenismos en la lengua de los conquistadores* (Río Piedras: Universidad de Puerto Rico, 1976), p. 98.

[89] Manuel Galeote, *Léxico Indígena de Flora y Fauna en Tratados Sobre las Indias Occidentales de Autores Andaluces* (Granada: Universidad de Granada, 1997).

authors had to say about the tiger, Oviedo's inclusion of an Amerindian name for this beast was not meant to set his natural history apart from earlier European iterations but to situate his practice within an older tradition, even if the material he had to offer was radically new.

Only once the citations and the enumeration of names was out of the way did Oviedo begin to describe the Indian tigers in earnest, but in a different way than the Spanish conquistadors who cobbled together descriptions of puzzling animals as best as they could from their mental repository of zoological knowledge. Instead of reducing them to the amalgamations upon which earlier authors relied, he looked to other ways to describe animals, often relying on sensory information to paint a different type of picture than one made up of disparate animal parts. These *ochi*, he wrote, were large and

> completely covered on their body and legs with black spots, some very close together, and all of them outlined in red, which make them beautiful. […] I have seen some of them grow more than three palms in height, and more than five palms in length. They are very thin in the legs and feet, and very well armed with teeth and claws. [90]

In describing the animals, Oviedo consciously moved away from the traditional literary themes of the wondrous, marvelous, and exotic nature of unknown lands— themes that were so prevalent in the accounts of earlier chroniclers. Even while focusing on creatures that were unknown in Spain, he still made the case that these animals were neither monstrous nor wondrous, simply different versions of more familiar creatures.

This extended to animals that were less easily subsumed into existing European categories. In his chapter on armadillos, while Oviedo wrote that "they are very strange to

[90] "Tiene […] todo el cuerpo e brazos e piernas pintado de manchas negras, unas a par de otras, perfiladas de color bermeja, que hacen una hermosa […] pintura. […] Yo le he visto más alto bien que tres palmos y de más de cinco de luengo; y son muy doblados y recios de brazos y piernas, y muy armados de dientes y colmillos y uñas," Oviedo, *HGNI*, vol. 1 p. 401.

the sight of the Christians, and very different from all the other animals that have been seen in other parts of the world," they were also strange for "this region of the world."[91] In other words, it wasn't that all American fauna were abnormal. The armadillo was just a peculiar animal, but its strangeness was not preternatural and nothing that could not be described in a sensible way. Oviedo relied on all his senses to describe this new animal. It was a quadruped covered with an extremely hard hide; its color was somewhat between white and brown, though leaning towards white; it was small, the size of a small dog, but its tail was long for its body, almost a palm in length; its skin was rough and somewhat scaly, like that of a lizard; it was a timid creature, and shied away from people; its snout was long; its three nails were very pointed, and allowed it to dig very quickly through dirt to make the subterranean caves in which it lived. Finally, its flesh tasted like that of a very fatty kid, though a bit sweeter, and prone to causing indigestion if the meat was not adequately salted.[92] Thus, the *encubertado*, as he called it, became an amalgamation of its color, size, texture, temperament, and taste.[93]

Taste especially was an important sense for Oviedo to convey, an understandable choice given that he wrote in the context of the Spanish empire and its utilitarian needs. He was cognizant of the needs of empire and had a nuanced understanding of the wishes

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[91] "… muy extraños a la vista de los chripstianos, y muy diferentes de todos los que se han visto en otras partes del mundo y en estas," Oviedo, *HGNI,* vol. 1, p. 411, emphasis mine. For more on Oviedo and marvels, see Antonello Gerbi, *Nature and the New World: From Christopher Columbus to Gonzalo Fernández De Oviedo*, Jeremy Moyle, tr. (Pittsburgh: University of Pittsburgh Press, 2010), pp. 287-88, 312.

[92] Oviedo, *HGNI*, vol. 1, pp. 411-412.

[93] For more on this sort of sensory experience for describing nature in the Spanish Americas, see Antonio Barrera-Osorio, *Experiencing Nature: The Spanish American Empire and the Early Scientific Revolution* (Austin, TX: University of Texas Press, 2006); and for the Spanish colonial project of gathering empirical knowledge, see Arndt Brendecke, *The Empirical Empire Spanish Colonial Rule and the Politics of Knowledge* (Berlin and Boston: De Gruyter, 2016).

of the Spanish court he dedicated his life to serving. When discussing plants, he mainly focused on those that had medicinal uses and could be exported to Europe for the nourishment of Spanish coffers. While animals had no such commercial value, they could serve as nourishment of a different sort. He detailed the edibility of nearly every animal he described. Some, like the indigenous dogs, were only to be eaten in times of great distress. Others, like the iguana, looked disgusting, but were actually quite palatable. Still others, like the armadillo and manatee, were downright delicious.[94] He mentioned the taste of quite a few animals, even going so far as to use not eyewitness, but mouth-witness to verify existence of an animal called the *mohuy*, one which he had never seen, "but there are many men who have eaten them, and praise this meat."[95] This was experiencing nature at its most visceral level, and illustrates that although Oviedo saw natural history as a bookish endeavor, this tradition could and did intermingle with empirical practices.

We see this coexistence most clearly in Oviedo's description of the iguana, a creature which he found particularly difficult to pin down. Over the course of his two printed books and the manuscript of the *Hıstoria,* his analysis of the animal changed. In 1526, he called it "a type of serpent with four feet," but referred the reader to an earlier chapter for more information.[96] There, we see Oviedo's uncertainty over the animal's classification. He wrote that "it is not certain if they are animal or fish, because they live in the water and in the trees and on land."[97] In 1535, he changed their classification again, grouping them with fish, even though in the text he indecisively wrote that "the Christians cannot decide if it is

[94] Oviedo, *HGNI,* vol. 1, pp. 390, 396, 412, 434.
[95] Oviedo, *HGNI,* vol. 1, p. 389
[96] Oviedo, *Sumario*, f. 32^{r}.
[97] "Ni esta averiguado si son animal o pescado: porque ellas andan en el agua y en los arboles et por la tierra," Oviedo, *Sumario*, f. 32^{r}.

flesh or fish."[98] Finally, in his manuscript, he wrote that while in his first published work he "put them in book 13, which deals with fishes […], now I think that they should go in this [book], which deals with terrestrial animals, even though, according to the opinion of many they could go in either book, because many people cannot decide if this animal is flesh or fish."[99] He finally invoked Pliny's authority to ultimately classify them not as a lizards, but as a quadruped, since the Roman mentioned that the tails of lizards grew back if they are cut off, and the iguana's tail remained stubbornly stubby in the case of a breakage.[100] In each iteration, Oviedo dithered over the animal's ultimate classification, but in the end an ancient authority provided the best evidence for what the iguana was not, even if its ultimate place in early modern taxonomy was still undecided.

Even Oviedo's empiricism was conducted within a framework very much informed by ancient authority. For example, he was fascinated by a story he heard that iguanas could live for days without food or water.[101] Some ancient authors said the same about chameleons, an animal that shared some external characteristics with iguanas. The idea that chameleons lived on air alone was a common belief, taken as fact by Pliny, and clearly an idea that held cultural valence until well into the seventeenth century.[102] If a chameleon could live on air alone, it was not so strange that another animal could go so long without

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[98] "No se determinan los xpianos si es carne o pescado," Oviedo, *Primera Parte*, f. 102v.
[99] "En la primera impression de [e]sta primera parte le puse en libro XIII, que tracta d elos pescados, [....] y agora me paresció ponerle en este que se tracta de los animales terrestres, non obstante que, segund la opinion de muchos a entrambos libros se puede aplicar, porque muchos hombres hay que no se saben determinar si este animal es carne o pescado," Oviedo, *HGNI*, Vol. 1, pp. 392-93.
[100] Oviedo, *HGNI*, vol. 1, p. 393.
[101] Oviedo, *Sumario*, f. 7v. This remains unchanged in the *Primera Parte*.
[102] Pliny the Elder, *Natural History: Books 8-11*, vol. 3, H. Rackham, tr. (Cambridge, MA and London: Harvard University Press, 1983), p. 51. It was also one of the erroneous beliefs tackled by Thomas Browne in his *Pseudodoxia Epidemicia*, see Howard Marchitello, *Narrative and Meaning in Early Modern England: Browne's Skull and Other Histories* (Cambridge: Cambridge University Press, 1997), pp. 10-11.

nourishment. To satisfy his curiosity, had kept some iguanas in his house to see what they ate. He even went so far as to have them "watched day and night," yet neither he nor the invigilators saw them eat.[103] In the late 1530s, he was gifted two large iguanas, and he saw an opportunity to really test this story and see if it was true. After eating the first iguana, he chained the second one up to a table. He wrote that he kept it there for more than 40 days, and in that entire time, it refused all the many types of food it was offered. When someone explained to him that the animal nourished itself from the earth it walked on, he designed an experiment ("*experiencia*") to test this theory.

Oviedo hoped to send the animal to Giovanni Battista Ramusio, secretary of Venice's Council of Ten and Oviedo's Italian publisher. He and Ramusio were also business partners and were involved in a joint venture to sell Italian goods in Santo Domingo, use the money to buy American sugar, which they then sold for a profit in peninsular Spain.[104] This established economic partnership also provided Oviedo with the perfect opportunity to send his Italian partner a curious pet and test the theory that iguanas either ate nothing or subsisted solely on dirt. Natural facts, not to mention unusual creatures, were commodities in Oviedo's imperial natural history; moreover, long-distance economic relationships provided perfect opportunities for research into animal behavior. Oviedo planned his experiment carefully. He filled a barrel with a known quantity of dirt, both so that the iguana would have plenty of food for the long voyage (if it indeed needed to eat), and so that the dirt could be measured upon receipt to come to a firm conclusion about exactly how much the animal ate. With the dirt carefully measured and air freely available, he nailed the poor creature in the barrel and entrusted a captain to send the

[103] Oviedo, *HGNI,* vol. 1, p. 396.
[104] Gerbi, *Nature in the New World*, pp. 412-413.

animal to Italy with instructions to open the barrel in Spain, weigh the remaining dirt and add more food if needed. All of this took place while Oviedo was preparing the manuscript and hoped the experiment would soon yield empirical data to add to his book. Yet, a later note revealed that after not hearing back from the captain, Oviedo managed to track him down a few years later, only to learn that the animal died at sea.[105] Oviedo's experiment may have come to naught, but it revealed the extent to which his thinking was informed by received authority because he hoped to use the evidence to also make claims about the chameleon lore in the books of antiquity.

Though Oviedo's work was influenced by a longer tradition of natural history, it was not a direct reproduction of it, especially in his use of images. Pliny thought that pictures had no place in natural history. In an era without mechanical reproduction, images became corrupted as copyists (especially those with negligible artistic ability) duplicated them into new manuscripts. But Pliny did not think that was their only detriment. Pictures, he argued, were "apt to mislead" and could never capture the true essence of natural things.[106] Oviedo, on the other hand, lived in an era of reproducible woodcuts. As a result, he considered images to be (in some instances) as important as verbal description. In order to better describe the taxonomically fraught iguana, for example, he included a picture of it in both the 1535 and the 1547 editions of the *Primera Parte*. Similarly, he also included an image of the manatee because—like with the iguana—Oviedo had trouble fitting it into a neat category. Manatees, he explained to his readers, were strange because

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[105] Oviedo, *HGNI*, vol. 1, p. 396.
[106] Pliny, *Natural History,* book. 25, chapter 4. For the use of the printing press for scientific illustration, see Elizabeth L. Eisenstein, *The Printing Press as an Agent of Change: Communications and Cultural Transformations in Early Modern Europe* (Cambridge: Cambridge University Press, 1980).
[107] Oviedo, *Historia General*, vol. 1, p. 434.

they were fish that somewhat resembled quadrupeds. In fact, he wrote, if someone who had not seen the entire fish simply saw a butchered piece of it, they would assume it was beef![107] Both of these animals were, to European eyes, liminal, and they benefited from an image to convey the animal's true essence. Also, Oviedo and Pliny both realized the difficulty in translating an image faithfully from one person to another. In the printed work in which these images were reproduced, Oviedo took the time to roundly criticize the engraver for having done a poor job of translating his drawing into a woodcut.[108] Issues of reproduction notwithstanding, Oviedo nevertheless believed that the benefits outweighed the costs.

As early as 1526, Oviedo wondered about the possibility of using images to depict particularly thorny organisms. "There are some trees in the island of Hispaniola," he wrote in the *Sumario*

> that are very spiny, and I have never seen any plant or tree that is as wild, shapeless, and ugly. The branches are originally leaves, and as they grow longer and harder, other pulpy leaves grow from them. It would be very difficult to describe this plant with words; it would be much more satisfactory to make a sketch of it for through the eyes one can understand what cannot be described by words.[109]

The *Sumario* (printed, as it was, at his own expense) did not contain a picture of this particular plant, so he had to rely on words alone. However, this was a situation he clearly intended to remedy in the planned final printing of his opus. While in Italy, he trained in drawing. Although he was no Leonardo, Oviedo was still a competent draftsperson, which was quite uncommon among travelers to the New World, especially those tasked with

[107] Oviedo, *Historia General*, vol. 1, p. 434.
[108] Oviedo, *Primera Parte*, f. 103^{v}.
[109] Oviedo, *Sumario*, f. 43^{r}.

sending information of the natural world back to Spain.[110] His manuscript included nearly 80 drawings representing animals, plants, and ethnographical objects.[111] In terms of verisimilitude, his images left something to be desired—the historian Juan Pérez de Tudela called them "dull and devoid of merit"—but it is not the quality of the images that should concern us so much as Oviedo's intent in including them.[112]

In his working copy of the manuscript, the so-called *Manuscrito Monserrate*, we see both Oviedo's commitment to including images in his final work and to improving the quality of the images that already appeared in the 1526 and 1535 iterations.[113] As Daymond Turner showed in his census of the illustrations in the remaining manuscripts, Oviedo paid special attention to images. The margins next to his manuscript figures are full of notes to the printer about which images were completed and which ones were still to be prepared for printing. The drawing **[figure 3.1]** of the hammock, for example, is labeled 'still to be done' because he wanted to replace the earlier woodcuts in the printed works **[figures 3.2 and 3.3]** in order to give a more naturalistic sense of how a hammock functioned (even if his sense of bodily proportion could have used some work).[114] His quest for naturalism extended to the natural world, which we can see in a drawing of an herb called the *coyygaraca*. "Note," he told the printer, "that when this [image] is sent to

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[110] While this would change later with the expedition of Francisco Hernandez in 1577, by and large, the heyday of visual arts and Spanish scientific expedition was in the eighteenth century, see Daniela Bleichmar, *Visible Empire: Botanical Expeditions and Visual Culture in the Hispanic Enlightenment* (Chicago: University of Chicago Press, 2012). On Oviedo and art, see Gerbi, *Nature in the New World*, p. 181; María Concepcion García Sáiz, "Acerca de los Conocimientos Pictóricos de Gonzalo Fernández De Oviedo," in *América Y La España Del Siglo XVI: Homenaje a Gonzalo Fernández De Oviedo*, Francisco de Solano and Fermin del Pino, eds. (Madrid: CSIC, 1982), pp. 65-71.
[111] Daymond Turner, "Forgotten Treasure from the Indies: The Illustrations and Drawings of Fernández De Oviedo," *Huntington Library Quarterly* 48, no. 1 (1985).
[112] Quoted in Garcia Sáiz, "Acerca De Los Conocimientos Pictóricos."
[113] This manuscript was split into two, and a portion of it is in the Real Academia de Historia in Madrid, and the other portion is in the Huntington Library in California.
[114] "Por hacer," Oviedo, *HGNI*, Real Academia de Historia (RAH), 9/551, f. 16^{r}.



Figure 3.1: Hammock, *Manuscrito Monserrate*


luengo: ℣ algo mas angoſtas que luengas: y enlos cabos eſtan llenas de
cordeles luengos de Cabuya y de Henequen: (la qual manera deſte hi=
lo ℣ ſu diferencia/ adelante ſe dira) y eſtos hilos ſon luengos ℣ vanſe a jũ
tar ℣ concluyr juntamente: ℣ hazenles al cabo vn trãcahilo/ como a vna

Figure 3.2: *Sumario* (1526)

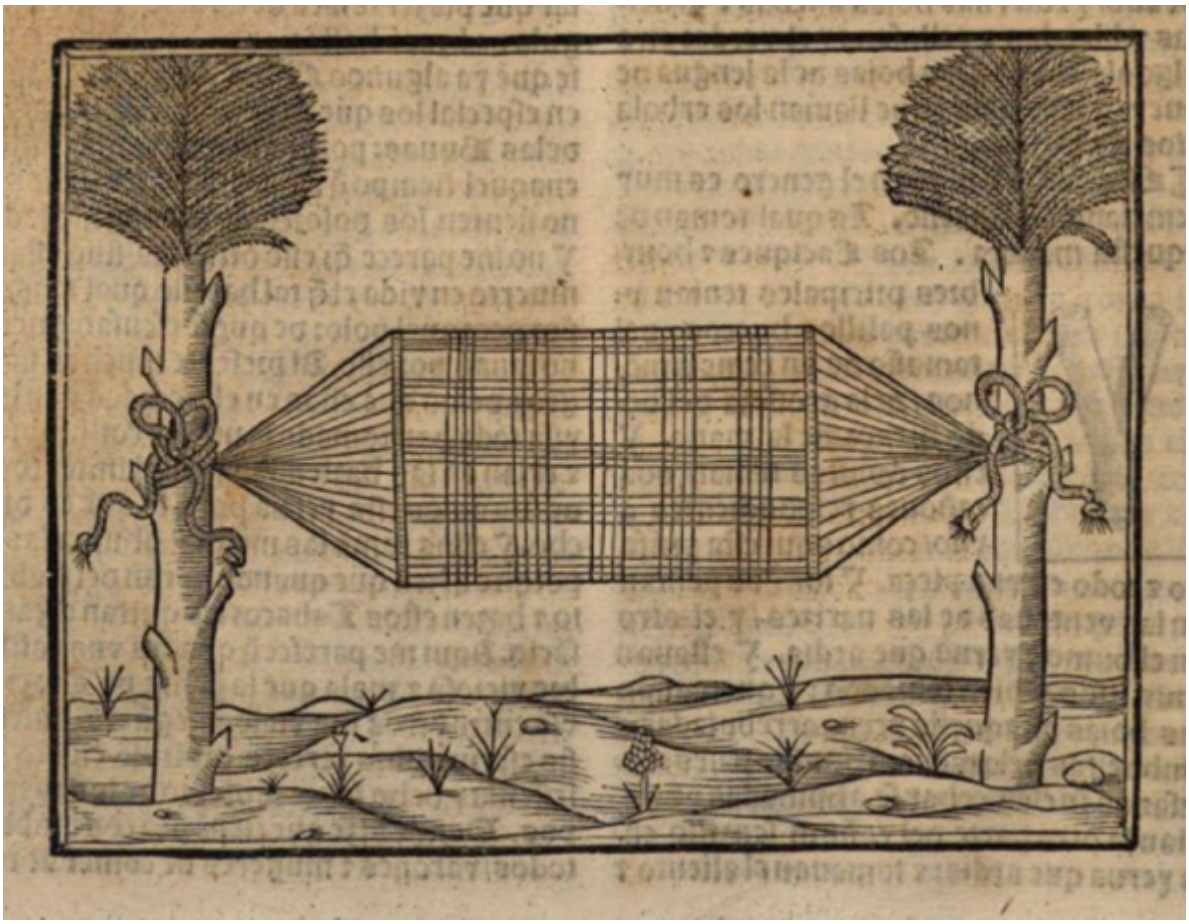

Figure 3.3: *Cronica de Indias* (1546)

the engraver, have the five stamens be two times less thick than they are now in these drawings."[115] In the text of the manuscript, he told his readers that he "believed that this [image] is very well done, and in a manner that will allow one to identify it from the drawing, […] so that people can find them and inquire more about their properties."[116]

Images were thus an integral part of Oviedo's description of the nature of the American continent. While some of his original manuscripts have been lost, an eighteenth-century copy (complete with duplicates of the illustrations) has survived. We cannot be certain whether the copyist, Juan Bautista Muñoz, replicated all of the illustrations, but from the images that are reproduced, as well as from clues in the text, Oviedo's plan for images was clear. Fundamentally, he found them conceptually important, especially for animals that were less known in Spain (he sketched out the sloth, jaguar, anteater, tapir, armadillo, opossum, llama, lemur, and iguana). However, he also believed that images were more than ancillary material to text. In many cases, the images were central to his description. For example, for the animals he called "northern cattle," he said he included an image "so that the reader might better understand me."[117]

He also sometimes used images instead of textual exegesis. In a chapter where he described some animals of Tierra Firme, he drew a picture of a "monstrous bird" and referred to the image rather than describing it with words.[118] Here, we see a central irony in the reception of classical authors in the sixteenth century. In a chapter that began by

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[115] "No[ta] q[ue] los Astilicos cinco sean la mitad mas delgados q[ue] estos dibujados q[ua]ndo se tallen," Oviedo, *HGNI*, Huntington Library (HL), HM 177, vol. 2, f. 80^{r}.
[116] "A mi paresçer ella esta muy bien contrahecha, y de manera que basta para la conoçer por este dibuxo, [...] para que puedan inquirir mas propiedades de ellas," Oviedo, *HGNI*, Vol. 1, p. 384.
[117] "y porque el lector mejor me entienda se pone aqui su figura," Oviedo, *HGNI,* vol. 1, p. 422. This note was not copied by Muñoz in the RAH copy.
[118] Oviedo, *HGNI*, HL, HM 177, vol. 1, f. 45^{v}.

citing Pliny on the dangers of poking torpedo fish with sticks, Oviedo did something that Pliny would have explicitly rejected—he used an image not only to supplement text but to momentarily replace it. Furthermore, his approach also marked a departure from other early modern illustrated works of natural history. In the case of a sumptuously illustrated manuscript of Pliny's *Natural History* commissioned by Giovanni Pico della Mirandola in the 1480s, Sarah Blake McHam argued that its images were "displays of erudition." They were never meant to be instructive.[119] For Oviedo, on the other hand, images had the capacity to be instructive in and of themselves, and his inclusion of them was one of the crucial ways in which he built upon, but did not limit himself to, ancient precedents. Instead of producing an imitation of Pliny's *Natural History,* Oviedo saw himself as a new Pliny, responding to the challenges of his era with a new set of tools.

A New Pliny

"It was the opinion of Pliny," wrote Oviedo, "that the things which most conserve and sustain the works of nature in mortal memory are the histories and books in which these things are written, and it is always taken as more truthful and authentic if the information is gathered and written down by a man who has traveled the world and seen these things with his own eyes."[120] In that opening sentence to the dedicatory epistle to Charles V in the *Sumario*, Oviedo killed two birds with one stone, both flattering the king by favorably comparing him to a Roman emperor, and using the authority of Pliny to differentiate his own work from that of his immediate predecessors, in particular,

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[119] Sarah Blake McHam, "Erudition on Display: The 'Scientific' Illustrations in Pico della Mirandola's Manuscript of Pliny the Elder's Natural History," in *Visualizing Medieval Medicine and Natural History, 1200–1550,* J.A. Givens, K.M. Reeds, A. Touwaide, eds. (Burlington, VT: Aldershot, 2006), pp. 83-114.
[120] Oviedo, *Sumario*, f. 1^{v}.

Martire's *Decades de Orbe Novo*. Unlike Martire, Oviedo proposed what he called a "true and new history," built on Pliny's model, and (unlike Martire's work) based on eyewitness authority.[121] He made this point more explicit in the manuscript to the *Historia General y Natural*. The prologue of the first book began by citing Pliny's own apologia, asking the king to

> compensate for the failures of my pen: as Pliny has written of his own failures in his prologue to the *Natural History*, it is a difficult thing to make old things new, to give new things authority, to give brilliance to that which is extraordinary, to give clarity to the obscure and wit to the uninspired, and to give authenticity to what is doubtful.[122]

The structure of his work also echoed that of his Roman predecessor, something he openly noted. In fact, to fail to acknowledge what is Pliny's, he continued, would be a crime. Moreover, he continued, just as Pliny wrote to the emperor, Oviedo would write directly and solely for the king.[123] This was, of course, flattery by someone who, although he had secured a position as a chronicler from the king, did not get paid as much as his predecessor.[124] Moreover, he also did not have the support of the *Casa de Contratación,* which was undergoing reforms in its own institution in order to create the position of the official cosmographer-chronicler.[125]

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[121] "verdadera y nueva historia," Oviedo, *Sumario* frontispiece.
[122] "En todo recompense Vuestra Magestad con mi desseo las faltas de la pluma: pues dixo Plinio de la suya en el prohemio de la *Natural historia*, que es cosa dificil hacer las cosas viejas nuevas, é á las nuevas dar auctoridad, é á las que salen de lo acostumbrado, dar resplandor, é á las obscuras, luz; é á las enojosas, graçia; é á los dudosas, fe." Oviedo, *HGNI*, vol. 1, p. 5.
[123] Oviedo, *HGNI*, vol. 1, p. 6.
[124] For Oviedo's salary, see Archivo General de Simancas (AGS), Estado, 636, f. 101[r]; for the salary paid to other royal chroniclers, see Richard L. Kagan, "Clio and the Crown: Writing History in Habsburg Spain," in *Spain, Europe, and the Atlantic World: Essays in Honor of John H. Elliott*, Richard L. Kagan and Geoffrey Parker, eds. (Cambridge: Cambridge University Press, 1995), p. 75.
[125] See Portuondo, *Secret Science*, chapter 3 for the reforms for the position, and chapter 4 for the responsibilities of the chronicler, especially pp. 159-164 for how it impacted the writing of history.

Pliny was Oviedo's most direct model, and he was also his most cited authority. Throughout the *Historia General y Natural*, he constantly referenced the Roman, even in cases where the connection was tenuous. For example, his discussion of Amerindian canoes began not with the boats themselves, but with what Pliny said about the boats of the East Indies because the latter, he believed "must be the same as the ones used here by the Indians."[126] What followed was a thorough description of the Amerindian canoe, complete with native names and a sketch, which formed a striking juxtaposition with the Plinian citation, and suggests not a rejection of the ancients, but a conscious effort to include them.[127] This fit with the plan of his work: to mix traditional academic constructs with new empirical data and an emphasis on witnessing and the explanatory power of images. While Oviedo referenced Pliny throughout the *Historia Natural,* the bulk of the references unsurprisingly appeared in the description of plants and animals. He reminded his readers that Pliny dealt with terrestrial animals in book 8 and apologized that he would not get to it until book 12, though he assured them that this change was not important since he would imitate Pliny in the distinctions and groupings of animals.[128] In substance, he argued, his work was identical to Pliny's. He also used the Roman as a foil. When Oviedo wrote about native dogs that were mute, he argued that his readers should not

[126] "Estas tales navetas creo yo, que deben ser como las que acá usan los indios, que son desta manera…," Oviedo, *HGNI*, vol. 1, p. 174.
[127] The image of the canoe appeared in the 1535 printing, but Oviedo was not satisfied with the outcome so in the preparation for the final manuscript, the canoe was drawn even before the text was added, and it was an updated picture, see HL, HM 177, f. 8r.
[128] "aunque sea de ymitarle en las distinçiones é géneros de las cosas escribe […] No me paresçe que es de substançia el número de ocho ó nueve ú otro cuento alguno del libro," Oviedo, *HGNI,* vol. 1, p. 386.

disbelieve him, because, after all, Pliny wrote that in Cyrene the frogs were also mute, and he softened his odd description of iguanas by citing Pliny's account of dragons.[129]

However, Oviedo was not content simply to include copious citations and follow Pliny's model in all things. Rather, as historian Antonello Gerbi argued, he wanted to "render [Pliny] eternal homage in becoming himself, proudly and enthusiastically, the Pliny of the lands across the ocean."[130] However, this overstates Oviedo's reverence for Pliny. He was quick to point out the mistakes of the latter, even if he never rejected his model. In the same sentence where he declared his intention to copy Pliny's structure, for example, he told his readers that Pliny had been mistaken about the habitability of the Torrid Zone.[131] Not only were Pliny's facts incorrect, Oviedo argued, but his method of gathering information also left something to be desired. "I have not culled [my writing]," Oviedo informed his readers,

> from two hundred thousand volumes I might have read, as Pliny said he did. […] I compiled what I write from two hundred thousand hardships, privations, and dangers in the more than twenty-two years that I have been personally witnessing and experiencing these things […] and having crossed the ocean eight times.[132]

While Pliny's work served as an important model and Oviedo did see his own work as the logical extension of the much earlier *Natural History*, he used it in a way that fit the needs and indeed the realities of his own time. This was of course what Pliny's readers had done since the work was published.[133] However, working in the New World and writing about

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[129] Oviedo, *HGNI*, vol. 1, pp. 319, 393.
[130] Gerbi, *Nature in the New World*, p. 139.
[131] Oviedo, *HGNI,* vol. 1, pp. 11-12.
[132] "las quales no he sacado de dos mill millares de volúmenes que haya leydo, come en el lugar suso alegado Plinio escribe, en los qual pareçe que él dixo lo que leyó; […] Yo acumulé todo lo que aqui escribe de dos mill millones de trabajos y neçesidades é peligors en veynte é dos años é mas que ha que veo y experimento por mi persona estas cosas […] y avenido ocho veçes pasado el grande mar Océano," Oviedo, *HGNI,* vol. 1, p. 6.
[133] Charles G. Nauert, Jr., "Humanists, Scientists, and Pliny: Changing Approaches to a Classical Author," *The American Historical Review* 84, no. 1 (1979): 72-85.

its plants and animals meant that writers of American natural histories had to adapt the model much more than their predecessors.

Causes and Reasons: Animals in Acosta's *Historia*

Like Oviedo, José de Acosta's *Historia Natural y Moral* also looked to older models to serve as the basis for his works. But, unlike Oviedo, who sought to catalog diversity, Acosta took a different approach. "Many authors," he wrote in the preface to his work "have written various kinds of books and accounts where they give notice of the new and strange things which have been found in these parts. [….] But, up until now, I have not seen any author try to disentangle the causes and reasons of those novelties and wonders of nature, nor make a discourse and investigation in this vein."[134] Acosta's priorities were different from those of Oviedo and other authors of New World accounts, and his religious commitments no less than his metaphysical ones determined the course that his work would take.[135] As a result of his education, his work leaned more heavily on Aristotle than did Oviedo's, though both used ancient sources to inform their thinking.[136] However, unlike Oviedo, who did not see his modifications as a rejection of the Plinian model, Acosta was more critical of the applicability of an older framework to describe the modern

[134] "Del nuevo mundo […] han escripto muchos Autores diversos libros, y relaciónes: en q[ue] dan noticia delas cosas nuevas e estrañas, q[ue] en aquellas partes se ha[n] descubierto. […] Mas hasta agora no he visto Autor, que trate de declarar las causas y razon de tales novedades y extrañezas de naturaleza, ni que haga discurso, è inquisicon en esta parte," José de Acosta, *Historia Natural y Moral de las Indias* (Seville: Juan de Leon, 1590), p. 9.
[135] Sabine MacCormack, "Ancient Authorities Intertwined: Natural Philosophy, History, and Theology in the Writings of José de Acosta, S.J. (1540–1600)," *Journal of Jesuit Studies* 2, no. 1 (2015): 1-35.
[136] On Jesuit education, see John W. O'Malley, *The First Jesuits* (Cambridge, MA: Harvard University Press, 1993), pp. 208–212; Ford, "Stranger in a Foreign Land," especially pp. 22-24; Jaska Kainulainen, "Virtue and Civic Values in Early Modern Jesuit Education," *Journal of Jesuit Studies* 5, no. 4 (2018): 530-548.

world. What interested him, as Sabine MacCormack argued, was the question of *why* ancient authorities were, at times, in error.[137] Acosta applied this question to the investigations he undertook in his decade in the New World and dedicated the *Historia Natural y Moral* to providing answers to it.

Early in his *Historia Natural*, Acosta described his desire to write either an Aristotelian or Plinian natural history, but eventually conceded the impossibility of it. "If it were possible to write copiously about the natural things of the Indies, and to write with the consideration that such notable things require," he wrote, "I do not doubt that one could write a work that reaches the heights of those of Pliny, Theophrastus, and Aristotle." However, while he clearly saw it as a *laudable* goal, it was one would not pursue. "I don't have that objective in myself," he continued, "nor would it agree with my aim even if I did."[138] Rejecting the older model's attempt to describe the world in its entirety, he wrote that he

> intend[ed] nothing more than to take note of some natural things that I saw and contemplated while in the Indies, or that I heard from reliable persons, and which I believe are not commonly known in Europe. And so I will pass over many of them briefly, either because they have been written by others, or because they require more consideration than I have been able to give them.[139]

Acosta saw the encyclopedic project of these ancient authorities as too broad-reaching, and though it was an ideal to emulate, it was at the same time impossible to achieve. He

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[137] MacCormack, "Ancient Authorities Intertwined," p. 18.
[138] "si destas cosas naturales de Indias se uviesse de escrevir copiosamente, y con la especulacion que cosas tan notables requieren, no dudo yo, que se podria hazer obra, que llegasse a las de Plinio, y Theophrasto, y Aristoteles. Mas ni yo hallo en mi esse caudal, ni aunque la tuviera, fuera conforme a mi intento," Acosta, *HNMI*, vol. 1, p. 118, emphasis mine.
[139] "no pretendo mas, de yr apuntando algunas cosas naturales, que estando en indias vi, y considerè, o las oy de personas muy fide dignas: y me paresce, no esta[n] en Europa tan communme[n]te sabidas. Y assi en muchas dellas passarè sucintamente, o por estar ya escritas por otros, o por pedir mas especulacio[n], de la q[ue] yo les he podido dar," Acosta, *HNMI*, vol. 1, p. 118.

did not replicate its vast scope, but he did borrow the overall pattern. Even though he was more willing than Oviedo to publicly acknowledge the utility of gathering information from trusted sources (and he routinely mentioned the vast network of Jesuits upon which he depended on for information), he still believed that even that relying on personal networks was not enough to be able to complete as all-encompassing as the works of Aristotle, Pliny, or Theophrastus.[140] Acosta's reform, therefore, was methodological. Insofar as natural history (but particularly animal description) was concerned, he explicitly decided to mention only those things that were indigenous only to America and unknown in Europe, and which he or those in his networks saw for themselves. He left it to others, Acosta wrote, to describe the animals that existed in both the old and new worlds, as well as those that only lived outside of the Indies.[141] He had to do this because the program of writing a natural history as Pliny had done had become too large and unruly for any one person to attempt.

Acosta respected the work and the authority of ancient authors, but like Oviedo, he also did not see them as beyond reproach. Acosta famously laughed when he crossed into the Torrid Zone, and, despite what Aristotle averred about the burning heat of the region, felt a chill that made him want to retreat into the sunshine and warm up.[142] He also

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[140] For the Jesuit's role in early modern science, see Peter Dear, "Jesuit Mathematical Science and the Reconstitution of Experience in the Early Seventeenth Century," *Studies in History and Philosophy of Science* 18, no. 2 (1987): 121-164. See also the essays in Mordechai Feingold, ed. *Jesuit Science and the Republic of Letters* (Cambridge, MA: The MIT Press, 2002). For Jesuit science and global networks of knowledge, see Steven J. Harris, "Confession Building, Long Distance Networks, and the Organization of Jesuit Science," *Early Science and Medicine* 1, no. 3 (1996): 287-318; Paula Findlen, "How Information Travels: Jesuit Networks, Scientific Knowledge, and the Early Modern Republic of Letters," in *Empires of Knowledge: Scientific Networks in the Early Modern World*, Paula Findlen, ed. (Abingdon: Routledge, 2019).

[141] Acosta, *HNMI*, p. 118.

[142] Acosta, *HNMI*, p. 102. See also Anthony Grafton, *New Worlds, Ancient Texts: The Power of Tradition and the Shock of Discovery* (Cambridge, MA: The Belknap Press of Harvard University Press, 2002).

wondered at Pliny's ignorance of the lodestone's most useful characteristic, writing that "although [Pliny] was a conscientious historian of natural things," he managed to miss the most remarkable fact about it—that it unfailingly moved metal needle to point due north.[143] By the time he reached the section on the flora and fauna of the Indies, the litany of errors he presented took on the air of the deadest of dead horses. "It is an amazing thing," he wrote, "to consider the many differences in shape and tastes and properties [of fruit trees] never before known and heard of in the world before the discovery of the Indies, and of which Pliny, Dioscorides, Theophrastus, and other scholars achieved no knowledge despite their diligence and curiosity."[144] Diligence and curiosity, in other words, were not enough. For Acosta, it was not that the ancients were unintelligent; they were simply unaware of a region in which their understanding of the world did not apply.

Acosta respected the works of his predecessors, but he came to the realization that they were not always relevant to the modern world in the way that many of his contemporaries tried to make them. He used the vicuñas and the native sheep of the Americas to prove that point. These animals, he argued, were absent from ancient texts not for lack of diligence on the part of their authors, but because they simply did not exist in the places where these men did their work. Acosta noted that some of his contemporaries tried to identify these American animals with the wild goats of Aristotle and Pliny, and while there were some similarities between these animals, Acosta was clear:

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[143] Acosta, *HNMI*, p. 53. For Pliny's discussion of the magnetic qualities of the lodestone, see Pliny *Natural History*, 36:16; 34:14; 37:4.

[144] "Es bien considerar […] tanta variedad de arboles y frutales […] y es cosa admirable, ver tantas diferencias de hechuras, t gustos, y operaciones no conocidas ni oyidas en el mundo, antes que se descubriessen las Indias, de que Plinio, y Diescorides, y Theophrasto, y los mas curiosos ninguna noticia alcançaron con toda su diligencia y curiosidad," Acosta, *HNMI*, pp. 258-259.

"in fact, they are not the same animal."[145] Rather than grasp for concordances where there were none, Acosta came to the conclusion that the time was ripe for a new natural history, one that would include all of these new animals on their own terms, and not try to force them into older categories. Instead, Acosta argued that he would, like a modern-day Aristotle, seek to determine the "causes and reasons of [the] novelties and wonders of nature," while still working within the larger objective for his work.[146] Acosta intended the *Historia Natural y Moral* not solely "to inform of what is happening in the Indies," but to also help in the conversion of the Amerindians.[147] As a result, he added a moralistic framework to the Aristotelian search for causes and the Plinian enumeration of the natural world. Everything he wrote, from his retelling of Amerindian origin stories to the description of the natural world, was meant to further his (and the Jesuits') religious agenda.

Noahaic Zoology and the Search for a Pious Natural History

Acosta's belief in the close ties between natural knowledge and religion, though odd to modern eyes, was not at all remarkable in the early modern world, especially not in a Spanish context.[148] The commentaries on Genesis by St. Augustine and St Basil sought to ground an understanding of the natural world in biblical texts, but by the end of the sixteenth century there was a robust movement that sought to build a new Christian

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[145] "Algunos han pensado que las Vicuñas sean, las que Aristoteles, y Plinio, y otros autores tratan quando escrive[n] de las que dizen *Capreas*, que son Cabras silvestres: y tienen sin duda similitud, por la ligereza, por andar en los montes, por parecerse algo a cabras. Mas en efecto no son aquellas," Acosta, *HNMI*, pp. 290-291.
[146] "…las causas y razon de tales novedades y estrañezas de naturaleza," Acosta, *HNMI*, p. 9.
[147] Acosta, *HNMI*, p. 300.
[148] María M. Portuondo, *The Spanish Disquiet: The Biblical Natural Philosophy of Benito Arias Montano* (Chicago: University of Chicago Press, 2019).

natural philosophy based on the Bible.[149] Acosta, too, was constantly trying to reconcile biblical and theological authority with the realities of the natural world. In the case of volcanoes, for example, he took on the common idea that they spewed out the fire of hell, and that "some say that it comes from there as a warning, to make us consider what the other life may be like."[150] However, he rejected this explanation of the world in terms or portents and omens. Instead, he used reasoning about the natural world fused with theological understanding to disprove this. "But if hell, according to what the theologians say, is in the center of the earth and the globe has a diameter of more than two thousand leagues, it cannot very well be said that the fire comes from the center," he reasonably argued. Moreover, as Saint Basil and others have told us, he continued, the fire of hell was different from the fire that we could see and burned brighter and hotter.[151] Acosta's explanation was that volcanoes were situated in places where the earth converted hot and dry emissions into flame and smoke, just like cloudy air was often converted into water and rainfall. To Acosta, this explanation was preferable, because it relied on both physical and biblical authority—rainfall was a common phenomenon, and biblical exegesis told him that fires of hell were altogether different from those that were seen on land.

This mode of reasoning by taking into account both biblical teaching and firsthand understanding of the natural world and weighing both as equally important also came up when Acosta discussed the animals of the region. An issue that was of pressing concern to him, and which cropped up throughout the *Historia Natural y Moral,* was that of the

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[149] Ann Blair, "Mosaic Physics and the Search for a Pious Natural Philosophy in the Late Renaissance," *Isis* 91, no. 1 (2000): 32-58.
[150] "para co[n]siderar por alli lo de la otra vida puede servir," Acosa, *HNMI*, p. 188.
[151] "Pero si el infierno està, como platican los Theologos, en el centro, y la tierra tiene de diametro msa de dos mil leguas, no es puede bien assenter, que salga de el centro aquel fuego," Acosta, *HNMI* p. 188.

seemingly unequal distribution of animals throughout the world. This was especially apparent in Acosta's work, since he exclusively discussed those animals that lived only in the Indies and nowhere else and had been unknown by Europeans up to the age of conquest. Acosta, as an ardent Jesuit, believed that all the terrestrial animals of the world must have had a berth on Noah's ark. And he was equally certain that the biblical deluge only happened once. There was, in other words,

> certainly not a second Noah's ark in which people were brought to the Indies, nor much less than some angel brought them holding them by the hair, as happened with the prophet Habakkuk because it is not a question of what God *could* do, but what conforms to reason and the order and style of human affairs.[152]

While Acosta was sure that God could intercede in whatever matter he chose, he still had "to proceed by the thread of reason, however thin it may be."[153] He rejected any miraculous instance of a second act of creation for both humans and animals and instead insisted that the real miracle was that humans and animals managed to migrate so far and that they remained hidden from Europeans for so long. While Acosta did not reject miraculous events in the past, he believed that in his own age, any divinely ordained event also had to conform with the natural order of things.

First, Acosta relied on what was in the Bible. That meant that there could not have been a second act of creation, either for animals or for humans.[154] Neither was it possible that these New World animals could the animals have "been produced from the earth

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[152] "Cierto no es de pensar que uvo otra arca de Noe en que aportassen hombres a Indias: ni mucho menos que algun Angel traxesse colgados por el cabello, como al Propheta Abacuch, a los primeros pobladores deste mu[n]do. Porq[ue] no se trata, que es lo q[ue] pudo hazer Dios, sino que es conforme a razon, y al orden y estilo delas cosas humanas," Acosta, *HNMI*, p. 51, emphasis mine.
[153] "yr por el hilo dela razon, au[n]que sea delgado," Acosta, *HNMI*, p. 51.
[154] The question of whether or not the humans of the Indies were descended from Adam was a hotly contested issue in early modern colonial America because it had profound implications for evangelization, see Lewis Hanke, *All Mankind Is One: A Study of the Disputation between Bartolome De Las Casas and Juan Gines De Sepulveda in 1550 on the Intellectual and Religious Capacity of the American Indians* (DeKalb, IL: Northern Illinois University Press, 1994).

without procreation."[155] While he believed that it was possible for so-called imperfect animals like insects and amphibians to spontaneously emerge from rotting matter, this could not be the case for quadrupeds, fish, or birds.[156] He also reasoned that people in the far-off past people could have sailed to the New World with animals in tow (as was the case in Acosta's own day with strange animals entering into Europe from Asia and Africa), that possibility could not explain the American situation.[157] He simply could not think of a single reason why anyone would bring "vile and worthless" animals like foxes and wolves on a sea voyage.[158] Also, empiricist that he was, Acosta would have no doubt had first-hand experiences with the tail end of a particular black-and-white American animal that sprayed a noxious liquid from its rear when threatened. "Who can persuade himself," he asked his audience, "that with such an infinity long voyage, there were people who took the trouble to carry foxes to Peru, and especially those animals called *añas*, which are the dirtiest and most stinking type of animal I ever saw? […] Really, it beggars belief even to

[155] Acosta, *HNMI*, p. 70.
[156] On spontaneous generation, see Aristotle, *History of Animals* vol. II: Books 4-6 (Cambridge, MA: Harvard University Press, 1970), p. 99; N. Von Hofsten, "Ideas of Creation and Spontaneous Generation Prior to Darwin," *Isis* 25, no. 1 (1936): 80-94; Justin E. H. Smith, *Divine Machines: Leibniz and the Sciences of Life* (Princeton: Princeton University Press, 2011), chapter 6; Daryn Lehoux, *Creatures Born of Mud and Slime: The Wonder and Complexity of Spontaneous Generation* (Baltimore: The Johns Hopkins University Press, 2017).
[157] Acosta, *HNMI*, p. 61. For Asian and African animals in Europe in the early modern period, see Joan Barclay Lloyd, *African Animals in Renaissance Literature and Art* (Oxford: Clarendon Press, 1971); T. H. Clarke, *The Rhinoceros: From Dürer to Stubbs, 1515-1799* (London: Sotheby's, 1988); Silvio A. Bedini, *The Pope's Elephant* (New York: Penguin Books, 2000); Annemarie Jordan Gschwend, "Exotic Animals in Sixteenth-Century Europe", in *Encounters: The Meeting of Asia and Europe 1500–1800*, Amin Jaffer and Anna Jackson, eds. (London: V&A, 2004); Marina Belozerskaya, *The Medici Giraffe: And Other Tales of Exotic Animals and Power* (New York: Little, Brown and Co, 2006); Palmira Fontes da Costa, "Secrecy, ostentation, and the illustration of exotic animals in sixteenth-century Portugal," *Annals of Science* 66, no.1 (2009): 59-82; Juan Pimentel, *El Rinoceronte y el Megaterio: Un Ensayo de Morfología Histórica* (Madrid: Abada Editores, 2010).
[158] "baxos y sin provecho," Acosta, *HNMI*, p. 70.

imagine it."[159] It was this certainty that led him to postulate that there was an as-yet undiscovered land bridge that connected the American continent to the rest of the known world so that humans and animals could have crossed over from the old world to the new.[160] This was an explanation that conformed to both his religious beliefs and understanding of the natural world.

Later in the text, Acosta had to grapple with a related question: how animals could exist in the Indies that were unknown in Europe, Africa, or Asia. A land bridge explained the presence of animals in the American continent, but it did not explain why the *ɑlɔɑɔ* or *ɔantɑɔ* he found in Spanish America seemed to exist nowhere else in the world. "This was a question," he wrote, "that has perplexed me for a long time," but one which he solved for his readers using the example of the "sheep of Peru."[161] "Sheep" was an expansive category, and, as Acosta pointed out, encompassed a variety of animals, including the alpaca, guanaco, llama, and vicuña—none of which were known in Europe. Given the theological necessity to preserve the Christian story of creation and the biblical deluge, he needed to propose an alternate solution, especially since the New World was rife with animals unknown in Europe. As he pointed out, "what I say about these guanacos and alpacas I can say about a thousand different birds, fowls, and wild animals [of the New World] which have never been known, either by their name or their image, and neither is there any memory of them in the works of the Latins or Greeks, nor in any nations of our

[159] "Quien se podra persuader, q[ue] co[n] navegacio[n] ta[n] infinita uvo ho[m]bres, q[ue] pusieron dilige[n]cia, en llevar al Piru […] añas, q[ue] es un linage el mas suzio y hediondo de qua[n]tos he visto? [….] Cierto es cosa de burla au[n] ymaginarlo," Acosta, *HNMI*, p. 70-71.
[160] Acosta, *HNMI*, p. 71-72. On the Acosta's land bridge theory, see Andrés I. Prieto, "Reading the Book of Genesis in the New World: José de Acosta and Bernabé Cobo on the Origins of the American Population," *Hɨɔpanófila*, 158, no. 1 (2010): 1-19.
[161] "es question q[ue] me ha tenido perplexo mucho tiempo," Acosta, *HNMI*, p. 282.

world."[162] This was a pressing question for him, not only because there were so many animals for which this was true, but also because its answer could have profound theological impact.

If these animals were not found in Europe, Acosta argued, it was not because God had instigated a separate flurry of creation specifically in the new continent. The animals in the New World were created at the same time as everything else. Instead, he argued that after the flood, different animals began to migrate to different regions of the world. In the case of the types of sheep that Amerindians in Peru called llamas and alpacas, "by a natural instinct and the providence of heaven," these animals crossed a land bridge and ended up in South America. Once they found a place they liked, he argued, they simply never left. Though he did not make a proto-evolutionary argument, he did point out that if these animals did leave their established habitats, "they did not thrive, or over time, they came to perish, as often happens.[163] This was a process Acosta experienced himself—though Castilian sheep readily adapted to Peruvian ecology and thrived, repeated sixteenth century attempts to bring dromedaries to the New World via the Canary Islands ended in dismal failure.[164]

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[162] "…jamas han sido conocidas, ni de nombre, ni de figura, ni ay memoria dellos en Latinos, ni Griegos, ni en naciones ningunas destem undo de aca," Acosta, *HNMI*, p. 283.
[163] "… por instinto natural, y providencia del cielo, diversos generos se fueron a diversas regions, y en algunas dellas se hallaron tambien, que no quisieron salir dellas, o si salieron, no se conservaron, o por tiempo vinieron a fenecer, como se sucede en muchas cosas," Acosta, *HNMI*, p. 283.
[164] On sheep and other old world animals in the New World, see Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* (Cambridge: Cambridge University Press, 1993); Elinor G. K. Melville, *A Plague of Sheep: Environmental Consequences of the Conquest of Mexico* (Cambridge: Cambridge University Press, 1994); Daniel W. Gade, "Llamas and Alpacas as 'Sheep' in the Colonial Andes: Zoogeography Meets Eurocentrism," *Journal of Latin American Geography* 12, no. 2 (2013): 221-243. On the dromedaries brought to the New World, see Duccio Bonavia and Javier Flores Espinoza, *The South American Camelids* (Los Angeles: Cotsen Institute of Archaeology at UCLA, 2009), pp. 465-470; Acosta, *HNMI*, p. 277.

Acosta was clear that what he called Peruvian sheep, though they were adapted to only a certain area of the world, were nonetheless still sheep. The differences between a European ovine and an Andean alpaca were, he argued, merely "accidental." Just like some humans were black, and others were white, he wrote, among sheep, "some are bare, and some are woolly, some are large and strong with long necks, like those of Peru; others are small and weak, with short necks, like those of Castile."[165] In other words, these differences were inherent to the animals themselves and not the result of their habitat or any degenerative force exerted by the climate of the region.[166] In this, Acosta's theological understanding colored his zoological understanding, and his zoological observations helped cement his religious convictions. The Jesuits were particularity concerned with the conversion of Amerindian inhabitants to Christianity, and a question that was widely debated amongst Catholics was whether or not the original inhabitants of the New World could be converted to Christianity.[167] By arguing that variations amongst animals did not make them inherently different from one another, Acosta also made the case that the people of the New World were not intrinsically different from Europeans and, as a result, could be (and ought to be) converted to Christianity. Throughout his work, Acosta forged

[165] "unos [son] rasos y otros lanudos: unos grandes y rezios, y de cuello muy largo como los del Piru: otros pequeños de pocas fuerças como los de Castillia," Acosta, *HNMI*, p. 283.
[166] This debate continued into the eighteenth century, and Georges-Louis Leclerc, count de Buffon, argued in his *Histoire Naturelle* that any plants and animals in the American continent would, on account of the climate, wither and weaken, see Lee Alan Dugatkin, *Mr. Jefferson and the Giant Moose: Natural History in Early America* (Chicago: Chicago University Press, 2019).
[167] Jorge Cañizares Esguerra, "New World, New Stars: Patriotic Astrology and the Invention of Indian and Creole Bodies in Colonial Spanish America, 1600-1650," *The American Historical Review* 104, no. 1 (1999): 33-68; Jean E. Feerick, *Strangers in Blood: Relocating Race in the Renaissance* (Toronto: University of Toronto Press, 2010); Rebecca Earle, *The Body of the Conquistador: Food, Race and the Colonial Experience in Spanish America, 1492–1700* (Cambridge: Cambridge University Press, 2012).

links between the natural world and biblical authority, in an attempt to write a natural history that both informed—and conformed with—sacred scripture.

Conclusion: A New Way of Doing Natural History

In his book about his time in South America, Ulrich Schmidt lamented that he had neither the room nor the expertise to adequately describe the animals of the region. This was the case for most European travelers. They could and did describe the animals they encountered, but they were not equipped to (or interested in) systematically writing about the New World. Gonzalo Fernández de Oviedo and José de Acosta both wrote natural histories of the New World in the style of ancient works in this genre in order to include the American continent into the other works in that genre. However, in writing their works, each author came to realize that the ancient models they inherited were not always suitable for their purposes. Instead, they adjusted the model to better suit the subject matter and their audience. In the end, however, like Schmidt, they both determined that, at least in the case of the description of animals, they were unable to fully capture the entire scope of zoological knowledge.

In writing his *Historia Natural*, Oviedo found himself faced with one of the realities of natural history in the early modern period: mainly that no one person could write a complete natural history of even a circumscribed region based on personal eyewitness alone. At one point in his narrative, Oviedo referenced a picture he drew of a septentrional cow, an animal which, according to him, lived in the northern reaches of Florida, a region he had never visited.[168] Seemingly forgetting that he had, earlier in the work, promised

[168] Oviedo, *HGNI*, vol. 1, p. 422.

that, unlike Pliny, he would only write about what he had himself seen, in this description of the Floridian animal, he admitted that he was drawing on secondhand information. But the image itself, he said, was a faithful representation of the creature, one which he hoped would be rendered more faithful and reproducible once it was engraved and printed in hundreds of copies. Here, again, we see a seeming incongruity between Oviedo's reverence for Pliny, but embrace of a mode of explication that Pliny explicitly rejected. The availability of a printing press to accurately reproduce images rendered Pliny's objections moot, but the fact that Oviedo did not even mention Pliny's antipathy to images shows that he never intended to take the Roman author as a static authority, but to adapt the model for his modern needs.

In his work, Oviedo coupled the concerns of both general and natural history but had a particular focus towards the latter because he understood the realities of the needs of a growing overseas empire. Thus, his descriptions of the natural world must be understood within a larger context of global trade. At the same time, the emergence of a growing global interconnectedness allowed him not only to describe the creatures of one part of the globe in another, but also to at least attempt to send specimens (like his hungry iguana) to his far-flung correspondents in a way that was impossible in the time of the ancients.

If Oviedo tied the realities of empire to the concerns of natural history, José de Acosta tied the needs of Christian theology to natural philosophy. When he described the animals of the New World, he did not always follow an encyclopedic model, like Oviedo did. Instead, Acosta directed his efforts into determining why the animals of the new and old worlds were different. In so doing, he turned to sacred scriptures—not to tell moral tales, as did the authors of bestiaries—but to illustrate natural history. Like Oviedo,

Acosta adapted other models for his own writing, showing that these older examples were eminently adaptable.

For Oviedo and Acosta, there was no distinction between history and natural history. We see it not only in the titles and contents of their books, but in their approach to discussing the natural world. Also, for both authors, descriptions of animals were intimately bound up with other textual sources: Pliny, for Oviedo, and Scripture, for Acosta. These authors saw the utility of ancient models, and their approach to them were not ones of immediate dismissal. They took what they could from their textual forbearers and adapted them. While these models served Oviedo and Acosta well, in continental Europe, they had somewhat outlived their usefulness. Naturalists who wanted to discuss the animals of the American continent alongside those already known in Europe had to devise new strategies that considered the epistemological concerns of both natural history and natural philosophy.

CHAPTER 4: ANIMALS IN SEARCH OF A PLACE

Introduction: "A Creature called Armadillo or Tatu"

Sometime in the late seventeenth century, an amateur poet by the name of Powers applied both his pen and his dubious literary skills to natural history and wrote a series of descriptions of American flora and fauna. He described some objects in relatively straightforward prose—he stated, for example, that the "pacos or Indian sheepe or rather camell goat" were "certainly the most beneficial Animals in the world," since they provided meat, fine wool, and could carry heavy loads needing neither saddle nor shoes.[1] Other naturalia invoked in him a more poetic turn. "Do not y^{r} Palates much provoke," he warned of the pineapple,

> with this sweet Indian Artichoke […]
> By wch Lethiferous fatall juice
> They will the Bloody Flux produce."[2]

From the poetic heights of bloody diarrhea, Powers turned to the animal we would now call an armadillo, to which he dedicated two poems and a drawing (the only picture in the more than two dozen textual descriptions). In the illustrated ode to "a Creature called Armadillo or Tatu," he described an "Animall arm'd with Scale/ as if it weare a cote of Maile," and sketched next to it the unmistakable hinged carapace of that Central American animal.[3]

Even though by modern zoological standards, his textual description left something to be desired, Powers knew enough of what the animal looked like to draw a figure of this

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[1] British Library (BL), MS Sloane, 4020, f. 212^{r}.
[2] BL, MS Sloane, 4020, f. 215^{v}.
[3] BL, MS Sloane, 4020, f. 215^{v}.

seemingly chain-mail clad creature. By the late seventeenth century, this would not have been too surprising. For Powers and his contemporaries, this animal with a porcine snout and amazing ability to curl up into an impenetrable ball was immediately recognizable as one of the many creatures that had come to Europe from the New World. Powers' language itself echoed a description from nearly two hundred years prior, when the Spanish lawyer-turned-conquistador Martín Fernández de Enciso used a remarkably similar simile to describe this American animal in his *Suma de Geographia* (1519), the first widely published Spanish-language description of the American continent and an early example of what would become a long history of science in the service of the Spanish empire.[4] The book not only dealt with issues of navigation, but also provided a descriptive geography of the world, complete with a catalog of its most memorable flora and fauna.[5] Included in that list were not only the camels, elephants, reindeer, and other animals from the far reaches of the world, but also the theretofore unknown (for Europe, at least)

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[4] Martín Fernández de Enciso, *Suma de Geographia: q[ue] trata de todas las partidas y provincias del mundo, en especial de las indias…* (Seville: Jacobo Cro[m]berger, 1519). The literature on science and empire is vast. For the Spanish case, see María M. Portuondo, *Secret Science: Spanish Cosmography and the New World* (Chicago: University of Chicago Press, 2009); Antonio Barrera-Osorio, *Experiencing Nature: The Spanish American Empire and the Early Scientific Revolution* (Austin, TX: University of Texas Press, 2006); Daniela Bleichmar, Paula de Vos, Kristin Huffine, and Kevin Sheehan, eds. *Science in the Spanish and Portuguese Empires, 1500-1800* (Stanford: Stanford University Press, 2009); Daniela Bleichmar, *Visible Empire: Botanical Expeditions and Visual Culture in the Hispanic Enlightenment* (Chicago: The University of Chicago Press, 2012); Daniela Bleichmar, "Books, Bodies, and Fields: Sixteenth Century Transatlantic Encounters with New World Materia Medica," in *Colonial Botany: Science, Commerce, and Politics in the Early Modern World*, Londa L. Schiebinger and Claudia Swan, eds. (Philadelphia: University of Pennsylvania Press, 2007); Júnia Ferreira Furtado, "Tropical Empericism: Making Medical Knowledge in Colonial Brazil," in *Science and Empire in the Atlantic World*, James Delbourgo and Nicholas Dew, eds. (New York: Routlage, 2009); Alison Sandman, "Controlling Knowledge: Navigation, Cartography, and Secrecy in the Early Modern Spanish Atlantic," in *Science and Empire in the Atlantic World*, James Delbourgo and Nicholas Dew, eds. (New York: Routlage, 2009).

[5] Enciso's work is part of a larger Spanish cartographical tradition of prose cartography. For more, see Ricardo Padrón, *The Spacious Word: Cartography, Literature, and Empire in Early Modern Spain* (Chicago and London: The University Chicago Press, 2004).

animals of the Americas, especially those of Darién (in modern-day Panama), where Enciso spent most of his time during his two trips to the Caribbean. He was particularly taken with the armadillo.[6] As we saw in chapter 1, the analogical approach he took to describe it was a common one for authors who aspired to a broader readership than people who might have a professional interest in, for example, a navigational manual. However, Enciso did something else with this strange type of quadruped—he captured one with the intention of bringing the animal back, alive, to Europe. Unfortunately for both the conquistador and his new pet, it died. Despite this particular armadillo's luckless end, however, the impulse to capture live specimens was pervasive in early explorers, and it leads back to our poet.

By the late seventeenth century, it was almost impossible for Powers *not* to have seen an armadillo, either in a painting or engraving, as a dried carapace, or even as a live specimen. In London alone there were scores of these specimens, both in private hands in the semi-public collections that were the forerunners of modern-day museums. The same was true of cities both large and small throughout Europe. To give but one example, the famed "Chelsea knackatory" founded in 1690 by the self-styled Don Saltero had several of them by the seventeenth century.[7] That collection was assembled by James Salter, former valet to Sir Hans Sloane, from the cast-offs from the latter's collection, and the

[6] Enciso, *Suma de Geographia*, f. h6^{r}.
[7] Barbara Benedict, "Spectating Science in the Early Modern Collection," in *Travel Narratives, the New Science, and Literary Discourse, 1569-1750*, Judy A. Hayden, ed. (London: Routledge, 2016), pp. 211-212.

preponderance of armadillos in Salter's own collection reflects the positive glut of them in Sloane's.[8]

When Powers wrote his poems, then, this animal was far from a scarce sight in seventeenth century Europe, even as it remained a symbol of the mysterious west. If we return to his poem, after he gave a description of the creature, he noted that it was also complicated and confounding:

> In shape of snout hee is a Swine
> & like to him doth grunt and whine
> But if you view his scaly skin
> Hees Fish without and Swine within
> Creature of Amphibious nature.[9]

Here, the poet picked up on a central uncertainty about the animal: whether it was a quadruped, a fish, or a reptile. It was the uncertainty as to its very nature that confounded. If one went by its snout and the noise it made, then the animal was unproblematically a quadruped. However, if one went by its scales and aquatic habitat, then it was piscine. It seemed, then, that this creature should be an amphibian, which, in the earliest usage of the word was not strictly a zoological category, but descriptor of anything of an ambiguous nature. However, as a classificatory term, amphibian had increasingly narrowed its scope over the course of the seventeenth century, and it also did not make much sense to lump armadillos with frogs and toads. For Powers, then, these animals existed in a liminal position between several categories because of the tension between their internal and

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[8] The earliest published catalog from 1729 notes some "armadilla," *A Catalog of the Rarities to be seen at Don Saltero's Coffee-House in Chelsea* (London: Thomas Edlin, 1729), p. 15. By the thirty-sixth edition of that catalog, there were four, including an armadillo fetus preserved in spirits, and both a land and sea 'armadilla,' *A Catalog of the Rarities to be seen at Don Saltero's Coffee-House in Chelsea*, (London: s.n., 1790?), pp. 3, 14, 16. For Hans Sloan's own enormous collection, see James Delbourgo, *Collecting the World: Hans Sloane and the Origins of the British Museum* (Cambridge, MA: Harvard University Press, 2017).

[9] BL, MS Sloane, 4020, f. 215^{v}.

external natures. However, though they were difficult to slot into exiting zoological categories, scholars nevertheless turned to the traditions of emblems and moral stories to write learnedly about animals, and Powers' poems provide us with insight into some of the pressing issues and general trends in natural history writing about the American continent as it was practiced in countries outside of Spain and by people who did not have a direct connection with the project of imperial expansion.

In *Totemism,* Claude Levi Strauss wrote that animals are "good to think with," and in the case of early modern studies of animals, armadillos provide a particularly fruitful cognitive tool.[10] Powers' armadillo poems encapsulate what it was like to study and think about American animals in a broader European context. He shared these concerns with others who wished to make a more scholarly study of animals. Using the example of the armadillo in Europe, this chapter examines the course that natural history took as New World animals made their way into Europe. It traces armadillos as they traveled through the waters and lands of European imagination, until they eventually burrowed their way into a new home within European conceptions of nature.

First, the chapter looks at the processes of trade and exchange of natural specimens to show how these materials came into the hands of naturalists and collectors thanks to well-established networks of exchange not only between the New World and Europe, but also within Europe itself, as scholars, naturalists, and bureaucrats exchanged letters, information, and objects throughout Europe. The chapter then turns to how armadillos,

[10] Claude Lévi-Strauss, *Totemism* (Boston: Beacon Press, 1972). See, for example, Natalie Lawrence, "Exotic origins: the emblematic biogeographies of early modern scaly mammals," *Itinerario* 39, no. 1 (2015); Florike Egmond and Peter Mason, "Armadillos in Unlikely Places: Some Unpublished Sixteenth-Century Sources for New World 'Rezeptionsgeschichte' in Northern Europe," *Ibero-amerikanisches Archiv* Neue Folge 20, no. 1/2 (1994):3-52.

newly arrived in Europe, were ordered into both collections and encyclopedias of natural history. Because they did not fit neatly in one category, scholars were often at a loss as to where they should go. Liminal creatures like these strained the confines of traditional ways of grouping animals and represented a fundamental problem for naturalists who wanted to put the natural things of the New World into their proper places.

Things in Transit:

In 1523, Francisco de Garay, then governor of Jamaica, sent out an expedition to scout for a possible colony along the Panuco River in present day Mexico. When he reached a promising location, he ordered a smaller group to reconnoiter the region and draw up some maps. Cristóbal Pérez Hernán was part of that expedition. He was not just a soldier in Garay's employ; he was also a correspondent of Martire's, and the latter included his story in the *Decades Orbe Novo*.[11] Martire related that the soldier "took many new observations" about the region, all of which Martire deemed unworthy of recording, save for one. As we have discussed in chapter one, any report of new animals was sure to generate interest, far more than any novelty of cartography. Pérez Hernán, Martire wrote, caught sight of an odd quadruped grazing in a field where their contingent had stopped to take some measurements. Perez Hernán's description overlapped a great deal with Enciso's, in keeping with the observational strategies employed by early travelers to the New World as discussed in chapter two. According to Pérez Hernán, it looked like a knight's horse in miniature, fitted out for battle, and protected by silvery scales like those of a dragon. However, unlike a fearless warhorse, this creature was slow and timid, and at

[11] Pietro Martire d' Anghiera, *De Orbe Novo* (Alcalá de Henares: Michaele[m] d[e] Eguia, 1530), f. 106^{r-v}. For more on Martire and his correspondents, see chapter two of this dissertation.

the first sight of danger, it curled up into a perfect impenetrable ball. Interest piqued, he set off to capture it—not a terribly difficult feat, since the animal's main mode of defense was its hard shell, and besides that, it was not overly threatening. Once it was captured, he brought it aboard his ship, where it lived with the soldiers' domestic animals. Unfortunately for both captive and captor, the expedition was caught up in an Amerindian ambush. With supplies dwindling, he could no longer justify keeping his curious new pet and he likely learned what many other Spanish explorers after him would find to be true—armadillo meat was quite a delicacy.[12] Related only by the pen of Pietro Martire, the story of Pérez Hernán's armadillo was, by mere chance, saved from the obscurity of the intervening years. Martire did not include this anecdote of a European's attempt to bring home a new pet *because* of its rarity, rather, he included it *despite* the ordinariness of capturing animals with the intention of bringing them back to Europe.

The practice of collecting animals, either living or dead, is difficult to trace in the historical record because it was such a commonplace occurrence, and one that did not usually generate a paper trail. Unlike the trade in silver, plants, or other merchandise, with few exceptions, there were no large-scale and systematic attempt to transport American animals to Europe in the early modern period.[13] Instead of coming through the channels of exploitable goods, these animals came in ones or twos, the charges of the individual sailors,

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[12] Tales of their tastiness fill the pages of many travel accounts, and this characteristic even made it into a few encyclopedias of natural history whose authors had likely never tried it for themselves but heard plenty of stories about it. On the particular and pervasive problem of eating animals meant for the curio trade, see Louise E. Robbins, *Elephant Slaves and Pampered Parrots: Exotic Animals in Eighteenth-Century Paris* (Baltimore: The Johns Hopkins University Press, 2002), chapter 1.

[13] Even in the eighteenth century, when global travel was quicker, animals were still by and large brought individually, as Louise Robbins has pointed out in the case of eighteenth-century France, Robbins, *Elephant Slaves and Pampered Parrots*, chapter 1. Sending botanical samples was also difficult, but they came to Europe at a much greater volume than animals.

pilots, or travelers who caught them, and not listed in any ship's manifest. Also, this practice was habitual—after all, the image of a sailor even in our modern imagination is not be complete without a talking parrot or a cheeky monkey. As Louise Robbins pointed out in the context of the eighteenth century, "acquiring birds here and there may have been too routine to warrant notice, even when numbers ran into the hundreds."[14] What was true for birds was true for other animals as well; travelers brought back everything from hummingbirds to jaguars on ships bound for Europe from the American continent, along with the usual menagerie of livestock and working animals that were essential to every nautical voyage. Despite this, animals did leave traces in the archive, and one can reconstruct this traffic by finding their tracks in memoirs, letters, artwork, collections catalogs, and other sources. By the sixteenth century, American animals, especially armadillos, had become rather commonplace in Europe.

Starting in the late fifteenth century, travelers to the Indies caught animals with the intention of exhibiting them once they returned home. Sometimes, they were even successful. Upon his first landfall on what he believed to be the Indies, Christopher Columbus immediately noticed the "songs of the little birds" of the region were "so beautiful that a man would never want to leave this place. And there are swarms of parrots that obscure the sun, and birds of all sizes and so different from ours that it is a marvel."[15] It was not a surprise, then, that he returned to Spain with colorful parrots in tow. He was not the only one do so—the sheer numbers of American birds in Europe made them

[14] Robbins, *Elephant Slaves and Pampered Parrots*, p. 10.
[15] "y el Cantar d[e] los paxaritos q[ue] pareçe q[ue] e]l ho[m]bre nu[n]ca se quierra partir de aqui y las mandas d[e]los papagayos q[ue] ascureçen el sol y aves y paxaritos de tantas ma[n]eras tan diversas d[e]las n[uest]ras q[ue] es maravilla," Viajes de Cristóbal Colón, Archivo General de Indias (AGI), Patronato, f. 16^{r}.

almost emblematic of the continent.[16] One of the earliest maps depicting the New World, the 1502 Cantino Planisphere, literally put Brazil on the map with the gaudy colors of scarlet macaws, birds which would appear in European art from the early 1500s.[17] **[Figure 4.1]** In 1494, king Ferdinand of Spain issued an order to send a trapper to the Indies specifically to capture falcons, and an early condition of obtaining a royal license to go exploring in the New World was that those in charge would bring back parrots for the monarchs.[18]

Bringing back animals extended beyond birds, of course. In 1499, Vicente Yañez Pinzón, who had accompanied Columbus on his first voyage, set out on his own expedition to explore the South American coast and encountered a "monstrous animal" so singular that he captured it and its young to bring to the king of Spain. According to Angelo Trevisan, secretary to Venice's ambassador to Spain, Pinzón had trapped the mother with three of its young still in her curious belly pouch. The offspring died on the voyage (though not before they were seen by several credible witnesses), but he brought

[16] Marcy Norton, "Going to the Birds: Birds as Things and Beings in Early Modernity," in *Early Modern Things: Objects and Their Histories, 1500-1800,* Paula Findlen, ed. (London: Routledge, 2013), pp. 69-76.
[17] Unlike their African counterparts (which were already quite popular in Europe), American parrots tended to be both brighter and larger. For more on American birds in art, see Hugh Honour, *The New Golden Land: European Images of America from the Discoveries to the Present Time* (New York: Pantheon Books, 1976), pp. 35-37.
[18] "Por servicio mio que hagays buscae ende un redero para que vaya a las yndias para tomar halcones," Cédula del Rey a Don Juan de Fonseca, August 16, 1494, AGI Patronato, 9, f. 63v; "Asiento que hizo con sus majestades católicas Rodrifo de Bastidas sobre ir al descubrir en las indias," March 8, 1503, in *Colección de Documentos Inéditos al Descubrimiento, Conquista y Organización de las Antiguas Posesiones Españolas de América y Oceanía,* vol. II, Joaquín Francisco Pacheco, Francisco de Cárdenas, and Luis Torres de Mendoza, eds. (Madrid: Bernaldo de Quirós, 1864), pp. 362-366.

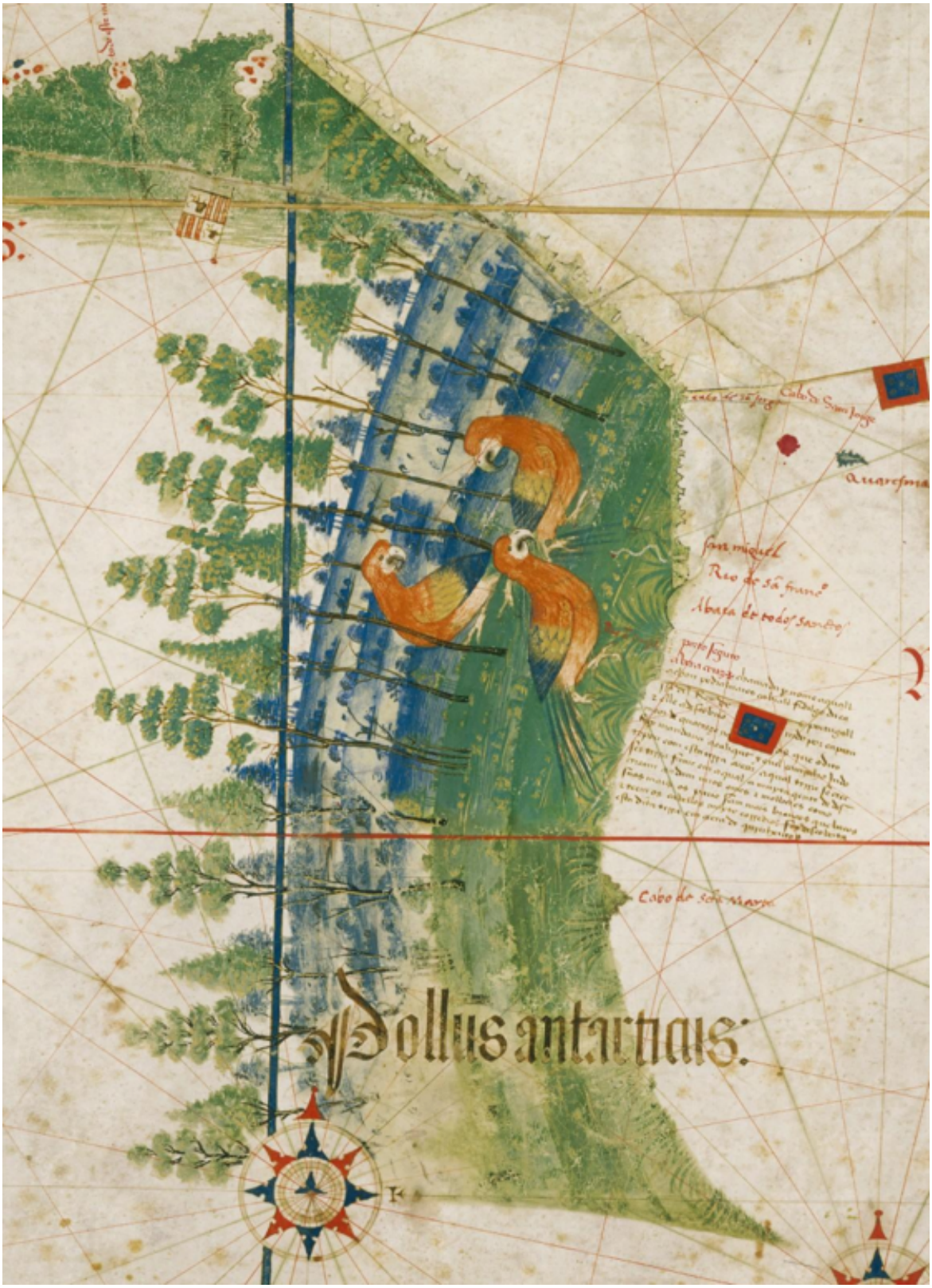

Figure 4.1: Carta del Cantino, 1502, Biblioteca Estense Universitaria, c.g.a.21

the mother from Seville to Granada specifically to present to the Spanish king.[19] A few years later, Hernán Cortés attempted to bring to Charles V two "tigers" he had captured on his travels, but, much to the consternation of everyone involved, not least the tigers themselves, the animals escaped from their cages and ate two sailors before someone managed to shoot them.[20] Sixty years later, in 1580, the governor of Cartagena sent another tiger to Spain, this time successfully, and like Pinzón's 1499 "monstrous animal," it was immediately dispatched to the court at Madrid as soon as it arrived in Seville.[21] Successes like these were a rarity.

The English explorer Roger Barlow, who was part of Sebastian Cabot's 1528 voyage along the southern coast of Brazil, found some "sort of smal byrdes [with] the goodliest colored fethers that ever a man might se, the colours would chaunge in moving of them as it were chaungable silke," and thought them so beautiful that he "toke one of them alive and kept it in a cage," knowing that it would cause a sensation if he could bring it back to Europe. Unfortunately, the bird "lived not long for lacke of knowledge to diet or other keeping," and for want of a better alternative, they "toke of the skynne, the heade, fete and featers […] and stuffed it with drie mosse and put it in a coffer."[22] Although that animal did not make it back alive, a note in a Spanish deposition after Barlow's expedition

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[19] Trevisan called it a "monstrosum animal," and an "animal quadrupes, prodigiosum…" in a letter to the Venetian admiral Domenico Malipiero. This letter was later printed as "De Navigatione Pinzoni socii admirantis, et de rebus per eum repertis," in Simon Grynäus, *Novus Orbis Regionum ac insularum veteribus incognitarum…* (Basel: Johannes Hervagius, 1532), pp. 119-121, quotation from p. 121.
[20] Pietro Martire, *De Orbe Novo*, f. 81^{v}.
[21] Carta Acordada del Consejo al Licenciado Diego Gasca, June 6, 1580, AGI, Indiferente, 1956, f. 96^{r}. See the introduction to this dissertation for another (failed) attempt to bring American tigers to Europe.
[22] Roger Barlow, *A Brief Summe of Geographie*, E.G.R. Taylor, ed. (London: Hakluyt Society, 1931), p. 161.

returned in the late 1520s indicates that he did manage to bring back three "Indian sheep" to the king of Spain.[23] There was great prestige attached to gifting a monarch with an American animal, even though it was difficult to keep anything alive long enough to make it back to Europe.[24] Likewise, there was a great demand to see in person what travelers told tales about, and conquistadors certainly obliged. Though in a piecemeal manner, indigenous American animals did come to Europe—sometimes dead, sometimes alive—and once there, they were no longer abstractions, but real animals that naturalists needed to incorporate into their works of natural history.

As these cases suggest, the New World marvels that did make it to Europe tended to remain in a courtly setting, but the huge outpouring of interest in curiosities meant that Europe was full of American animals, especially by the end of the sixteenth century. [25] This increase coincided with the rise of new sites for natural history knowledge-making, including gardens and museums, and a new urge to transport naturalia not only from the New World to Spain, but also within Europe itself. It also coincided with the desire to get new animals and plants into the hands of not just royalty, but also the generally curious, including naturalists who, like Oviedo and Acosta, were writing encyclopedias of natural history.[26] Unlike those people, European naturalists did not have the same kind of access

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[23] E. G. R. Taylor, "Introduction," in Barlow, *A Brief Summe of Geographie*, p. xl. See also José Torbio Medina, *El Veneciano Sebastián Caboto al Servicio de España,* vol. 1 (Santiago de Chile: Imprenta Universitaria, 1908), pp. 181-182.

[24] European monarchs had always had menageries in their courts as a way to project authority, see, for example, Eric Baratay and Elisabeth Hardouin-Fugier, *Zoo: A History of Zoological Gardens in the West* (London: Reaktion, 2002); Nigel Rothfels, *Savages and Beasts: The Birth of the Modern Zoo* (Baltimore: The Johns Hopkins University Press, 2012); Caroline Grigson, *Menagerie: The History of Exotic Animals in England, 1100-1837* (Oxford: Oxford University Press, 2016). Because of the length of the Atlantic voyage, however, it was comparatively easier to bring back exotic animals from the African or Asian continents.

[25] Barrera-Osorio, *Experiencing Nature*, p. 121.

[26] For more on those naturalists, see chapter three of this dissertation.

to the world's wonders as the Spaniards did. But they disagreed with Oviedo that one had to inhabit a place to write about its natural history. Instead, they relied on specimens and information sent to them from all over the world from other European correspondents.

Still, sending naturalia even within the bounds of Europe was fraught with difficulties. For example, in 1595, the Dutch naturalist Carolus Clusius sent a letter to his friend Benito Arias Montano, a Spanish humanist whom he had met in Antwerp in the late 1560s. The two shared an interest in both philology and natural history, and Arias Montano was instrumental in sending Clusius books about the Indies. Arias Montano was also part of a larger correspondence network, and he brokered trades of other material within his own network of friends in Spain.[27] On one occasion, Clusius had sent, via Arias Montano, a packet of seeds to Simón de Tovar, a prominent Spanish collector based in Seville whose garden Clusius had toured in 1564.[28] As Arias Montano wrote, "as soon as I recognized the author's hand, I was gladdened, but after having read it, I was much surprised that it had been delivered to me so late, after the passage of several months."[29] Not only was the letter late, but it had also been opened at some point, and its contents disturbed. Someone had ransacked the packet of seeds and all the labels had disappeared, something which, as Tovar told Arias Montano, was uncharacteristic of the meticulous

[27] For a general overview of Clusius's network, see Florike Egmond, "Clusius and Friends: Cultures of Exchange in the circles of European Naturalists," in *Carolus Clusius: Towards a Cultural History of a Renaissance Naturalist*, Florike Egmond, Paul Hoftijzer, and Robert Visser, eds. (Amsterdam: Koninklijke Nederlandse Akademie van Wetenschappen, 2007), pp. 9-48; For the Spanish case, see Josep L. Barona, "Clusius' Exchange of Botancal Information with Spanish Scholars," in *Carolus Clusius*, pp. 96-116.
[28] Carolus Clusius, *Rariorum plantarum historia* (Antwerp: Christoffel Plantin, 1601), p. 173.
[29] "… quam primum scriptoris manum ex descriptione agnovi, gratulatus ipse mihi sum, at vero postquam perlegi, miratus valde tam sero, tam longo, inquam, intervallo mensium mihi demum redditas," Letter from Benito Arias Montano to Clusius, 1596-02-19, Universiteitsbibliotheek Leiden (UBL), VUL 101, Montano 4.

Dutch naturalist. To prevent future misadventures, Arias Montano gave Clusius a handy Spanish phrase that he could write on the letter's wrapper – "In the service of His Majesty" – in the hopes (vain, as it turned out) that this might deter further theft.[30]

Theft was a common problem, and no amount of untruthful association with the monarchy could stem that. When Tovar died in 1596, another Spaniard, Rodrigo Zamorano, the royal cosmographer and head of the *Casa de Contratación* became Clusius's main source for American naturalia. His first delivery to Clusius included a *nopal* from New Spain, a plant whose transport out of the New World was a criminal offense because it was the host species for the famed cochineal beetle.[31] As the head of the organization that enforced these rules, however, Zamorano was unlikely to prosecute himself, and he likely viewed his exchange with Clusius as part of the Republic of Letters, and outside of the world of commerce that the *Casa* was tasked to regulate.[32] "I performed this small favor for you," he wrote, "with great pleasure, as I wanted you to approve my care with regard to plants and to [include me] in your list of friends and admirers," and he hoped

[30] The letter was written entirely in Latin with just one exception: "por servicio de Su Magestad" was written in Spanish, suggesting where Arias Montano thought the blame might reside. Letter from Benito Arias Montano to Clusius, 1596-02-19, UBL, VUL 101, Montano 4.
[31] Jeremy Baskes, *Indians, Merchants, and Markets: A Reinterpretation of the Repartimiento and Spanish-Indian Economic Relations in Colonial Oaxaca, 1750-1821* (Stanford: Stanford University Press, 2000), pp. 9-15. The Spanish empire had a monopoly on the cochineal trade thanks to these safeguards, but their 250-year monopoly did end in the eighteenth century, see Londa L. Schiebinger, *Plants and Empire: Colonial Bioprospecting in the Atlantic World* (Cambridge, MA: Harvard University Press, 2004), pp. 39-44.
[32] On the place of money and commercialization in early modern natural histroy, see Brian W. Ogilvie, *The Science of Describing: Natural History in Renaissance Europe* (Chicago: University of Chicago Press, 2008), especially pp. 78-80. On the practice of scientific gift exchange, see Paula Findlen, "The Economy of Scientific Exchange in Early Modern Italy," in *Patronage and Institutions: Science, Technology, and Medicine at the European Court, 1500-1750*, Bruce T. Moran, ed. (Rochester, NY: Boydell Press, 1991), pp. 5-24; Natalie Zemon Davis, *The Gift in Sixteenth Century France* (Madison: University of Wisconsin Press, 2000); Felicity Heal, *The Power of Gifts: Gift Exchange in Early Modern England* (Oxford: Oxford University Press, 2014).

that this would translate into a reciprocal relationship of natural gifts.[33] However, as Zamorano later learned, the plants had never reached Clusius, and suspiciously, some of these specimens were later seen in the garden of the Count of Aremberg.[34]

Something similar happened to Tovar, who wrote to Clusius in 1596, frustrated that the botanical specimen box [*pyxiὼ*] he sent had not been delivered. "I vehemently lament," he wrote, and "I feel very unlucky that what I hoped would be pleasing to you, and what I prepared with great care and love unfortunately resulted to be useless, since it was intercepted and stolen."[35] However, pilfering was not the only worry on his mind. In this same response, he explained to Clusius that he would re-send the contents of the box, except for one species, of which he had only one remaining sample, "since it is infertile in our regions."[36] He was afraid that if he were to send it immediately in the shipment meant to replace the purloined objects, it would die because of inclement weather, leaving them both plant-less. Therefore, he thought it was more prudent to wait for his bulb to germinate later that spring rather than to trust his only remaining specimen to the capriciousness of fortune on the long sea voyage. "I do want to share with you this most elegant bulb," he wrote, "but I wish to do it in the most secure way and without risk."[37] He also described the precautions he took so that the other plants he was sending would make

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[33] On the economy of obligation in early modern scientific exchange, see Anne Goldgar, *Impolite Learning: Conduct and Community in the Republic of Letters, 1680–1750* (New Haven, CT: Yale University Press, 1995), pp. 12-33.

[34] "Id munusculum libens tunc obtuli, et meam in plantis diligentiam tibi probari cupiens, et amicorum ac tui studiosorum albo gestiens ascribi," Letter from Rodrigo Zamorano to Clusius, 1603-06-03, UBL, VUL 101, Çamoranus 1.

[35] "Quod […] vehementer doleo: in eo me parum fortunatum censem quod quae tibi grata fore cupiebam studiose et amanter a me curata, tamen, interceptu atque eversu cassa evaserint," Letter from Simón de Tovar to Clusius, 1596-02-13, UBL, VUL 101, Tovar 1

[36] "…apud nos infecundior existat," Letter from Simón de Tovar to Clusius, 1596-02-13, UBL, VUL 101, Tovar 1

[37] "Cupio namque vobis hunc elegantissimum bulbum quam certissime ac tutissime communem facere," Letter from Simón de Tovar to Clusius, 1596-02-13, UBL, VUL 101, Tovar 1.

it to Leiden alive, because as great (or perhaps greater) a risk to natural specimens than theft was outright death. He placed the replacement bulbs in sturdy pots full of earth, packed in boxes stuffed with moss to better withstand such a long journey. He also stressed the importance of finding good couriers to accompany the plants, asking that Clusius suggest some "sailors or friends whom you know are neither lazy nor negligent," since the plants had to be watered regularly, but not so much that damp would cause them to rot.[38]

This was a necessary precaution when voyages were as lengthy as they were in the early modern period. To return to the waylaid letter that Clusius sent to Arias Montano in 1596, its delay meant that the letter took five long months to make its way from Leiden to Seville. However, the return voyage, which was presumably not intercepted by a sticky-fingered intermediary, still took nearly three months to arrive, a timeframe inimical to living things.[39] When Clusius sent Tovar the plants from his garden, few of them arrived in viable condition. Some of the bulbs did sprout, but the plants with tuberous roots—despite being well packed in their boxes—all arrived rotten, and Tovar could not plant them. "For now," he closed the return letter, "I am sending two small boxes and also two baskets in your name, my illustrious friend. […] I believe you know that bulbs do not take well to their transport to other lands, so that as soon as they begin to flower, they lose their flower and begin to wilt."[40] Tovar need not have worried. In a post-script to that letter dated one

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[38] "…nautis aut amicis aliis quos non segnes aut negligentes noveritis," Letter from Simón de Tovar to Clusius, 1596-02-13, UBL, VUL 101, Tovar 1.

[39] Clusius always noted on the letters the day that he received them, as well as the date of his response. Letter from Benito Arias Montano to Clusius, 1596-02-19, UBL, VUL 101, Montano 4.

[40] "Nunc vero duas mitto pyxides et duas etiam corbes vestris clarissimorum amicorum signatas nominibus. […] Namque vobis exploratum puto male ferri mutationem bulbis in alterum locum

month later, he wrote that while he had put the letter and the botanical boxes on a ship in Seville's port of San Lucar with the understanding that the ship was leaving immediately, this turned out not to be the case. Unbeknownst to Tovar, that ship decided to wait in port for another month to travel with a larger flotilla while his seeds and bulbs languished in the hold. Discouraged, he wrote in the postscript that most the bulbs had spoiled, and while he would still send the seeds, he would no longer send any bulbs unless Clusius sent a courier to personally pick them up.[41]

All of these problems—the time it took for things to travel, the unwillingness to part with one's only exemplar, and the very real possibility that specimens would die in transit—were only exacerbated when the specimens in question were not living plants but animals, which took less kindly to being stuffed in boxes or ignored for months on end. After Arias Montano's death in 1596, Clusius's main correspondent in the Iberian peninsula was the physician Juan de Castañeda.[42] More so than with Arias Montano (whose interests were primarily botanical), it was with Castañeda that he discussed animals. "I promise you," Castañeda wrote, "that we have here [in Seville] the greatest curiosities that anyone can desire, of animals and fish that have shells and natural defenses like those of turtles or tortoises. These are armadillos […] and other very strange

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transportandis, ex quo primum prodire flores incipiunt quoad omnino defloreant et marcescent," UBL, VUL 101, Tovar 1.

[40] "…nautis aut amicis aliis quos non segnes aut negligentes noveritis," Letter from Simón de Tovar to Clusius, 1596-02-13, UBL, VUL 101, Tovar 1.

[41] Postscript dated 1596-03-19, Letter from Simón de Tovar to Clusius, 1596-02-13, UBL, VUL 101, Tovar 1.

[42] Barona, "Clusius' Exchange of Botancal Information," in *Carolus Clusius*, pp. 110-111. For more on the Seville group of naturalists who exchanged specimens, see Barrera-Osorio, *Experiencing Nature*, pp. 122-127.

animals."[43] He explained that he could only, regrettably, send their names, "because, for not having more than one, they cannot be sent."[44] In another letter, he described two fish that a pilot had brought from Honduras, and although he did send a written description of both, again, he lamented that "if only there were someone who had them, I would send them to you."[45] Also in this letter, he noted that Rodrigo Zamorano (with whom Clusius had exchanged letters in the late 1500s) was the person responsible for having these fish sent back to Spain. "As examiner of the pilots in the passage to the Indies," he explained, Zamorano ordered that "every pilot who goes [to the Indies] is required to send him something new of extraordinary, and that is why the walls of his house are all covered in shells, fish, and remarkable animals."[46] Castañeda ended his letter with the vow that Clusius needed to only say the word, and he would marshal Zamorano's network to search for whatever he might want or need for his own work.[47] This was an offer that popped up in many of the other fifteen letters that Castañeda sent to Clusius, and he constantly reminded Clusius that a flotilla arrived in Seville every month with more exotic naturalia.[48]

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[43] "prometo a Vm. […] ay aqui […] las mayores curiosidades de que se pueden desear de todos los animales y peces que tienen conchas y defensas naturales al modo de tortugas o galapagos como armadillos, […y] otros animales muy diferentes," Letter from Castañeda to Clusius, 1600-10-20, UBL, VUL 101, Castañeda, 3.

[44] "por no tener copia no se pueden imbiar," Letter from Castañeda to Clusius, 1600-10-20, UBL, VUL 101, Castañeda, 3.

[45] "Si ubiera quien los tubiera yo lo estimara por solo imbiarlos a Vm," Letter from Castañeda to Clusius, 1601-10-20, UBL, VUL 101, Castañeda, 4.

[46] "Quien lo a juntado a sido el licenciado Zamorano que como examinador de maestres de la carrera de Yndias, cada maestre que ba tiene ha dicha traerle alguna cosa nueba o estraordinaria y asi tiene las paredes de los portales de su cassa todos llenos destas conchas, pezes y animales muy de ver," Letter from Castañeda to Clusius, 1601-10-20, UBL, VUL 101, Castañeda, 4. From my research into the archival documents from the *Casa de Contratación*, I surmise that this was a private request rather than an official policy.

[47] "VM me abise si se podria poner esto en execucion quen todo lo que no fuere de probecho al servicio de VM hare," Letter from Castañeda to Clusius, 1601-10-20, UBL, VUL 101, Castañeda, 4.

[48] Letter from Castañeda to Clusius, 1602-03-13, UBL VUL 101, Castañeda, 7.

Moreover, as he told Clusius, he and Zamorano were good friends—he had even delivered one of Zamorano's sons. Castañeda could use his bonds of friendship to ask for any natural curiosity from the New World. Zamorano would happily procure it for him and forward it to the Dutch naturalist.[49]

There were two issues at work here: Castañeda both knew that naturalists in the rest of Europe wanted to write global, encyclopedic natural histories, and he did not think that the circle of naturalists in Seville were equipped to do this work. When he wrote to Clusius about the armadillo, for example, he regretted that they did not have anyone who could draw and engrave it.[50] He even went so far as to suggest the artists in the Netherlands were "more hardworking than the people here, and know more," and if Clusius were to send him an artist, he could in turn send Clusius more skillfully executed drawings.[51] Castañeda understood that scholars were interested in accommodating novelties from the New World into existing frameworks of natural philosophy, but that this would happen best as a collaborative effort. Other naturalists disagreed.

Writing about the New World in the 1580s, Ulisse Aldrovandi complained that while "many historians of these places have described many plants and animals that are born there, nonetheless, they have not written of them *ex professo*; rather, of the profusion of natural things they found there, they have been forced to write and refer to their variety as it were incidentally and in passing, not even judging what they are."[52] Aldrovandi

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[49] Letter from Castañeda to Clusius, 1604-01-13, UBL VUL 101, Castañeda, 15
[50] "[…] si hubieramos quien lo cortara y pintara," Letter from Castañeda to Clusius, 1600-10-20, UBL, VUL 101, Castañeda, 3.
[51] Letter from Castañeda to Clusius, 1601-08-21, UBL VUL 101, Castañeda, 2. In a letter from 5 January 1602, he also complained that there were no engravers in Seville.
[52] Quoted in Lorraine Daston and Katharine Park, *Wonders and the Order of Nature, 1150-1750* (New York: Zone Books, 2001), p. 158.

argued that only an educated man could write *ex professo*, and an expert rendering of the natural world should be done by a trained naturalist, not a collection of ad hoc travelers. To that end, Aldrovandi also tried to convince the grand duke of Tuscany to send him to the New World so he could observe its nature for himself. Although the duke was convinced of the necessity of this, unfortunately for Aldrovandi, he chose someone else to undertake the journey.[53] In 1570, Spain's Philip II sent Francisco Hernández, his personal physican, on an expedition to write the natural history of the New World in the style of Pliny's *Natural History,* which the Spanish doctor was in the process of translating into Spanish. The publication of his resulting work, the *Historia Natural de la Nueva España* was mired with difficulties, however, and it was not published in its entierty during his lifetime.[54]

However, by the end of the century, networks of circulation that allowed for the travel of both goods and information were already firmly in place, making it possible for European naturalists to receive reliable information alongside the occasional specimen, and finally uncoupling travel from the act of writing. As Antonio Barrera-Osorio argued, these networks connected such far-flung places as Peru and Leiden, and everywhere in between, and their members "placed their own experience, reports, and collections at the

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[53] Paula Findlen, *Possessing Nature: Museums, Collecting, and Scientific Culture in Early Modern Italy* (Berkeley: University of California Press, 2010).

[54] For Philip's motivations for sending Hernández, see Peter O'Malley Pierson, "Philip II: Imperial Obligations and Scientific Vision," in *Searching for the Secrets of Nature: The Life and Works of Dr. Francisco Hernández*, Simon Varey, Rafael Chabrán, and Dora B. Weiner, eds. (Stanford: Stanford University Press, 2000), pp. 11-18; On the status of the texts see Rafael Chabrán and Simon Varey, "The Hernandez Texts," in *The Mexican Treasury: The Writings of Dr. Francisco Hernández*, Simon Varey, ed. (Sanford: Stanford University Press, 2000), pp. 3-24; and José María López Piñero and José Pardo Tomás, *Nuevos Materiales y Noticias Sobre la Historia de las plantas de Nueva España de Francisco Hernández* (Valencia: Instituto de Estudios Documentales e Históricos sobre la Ciencia, 1994), especially pp. 11-32.

center of new epistemological approaches to nature. From these activities and networks emerged the empiricism that characterized the new scientific practices of the sixteenth and seventeenth centuries."[55] These networks also made sure that, no matter the difficulties inherent in sending them, animals as well as plants eventually made it to cabinets, collections, and museums throughout Europe. While Castañeda lamented that he could not send Clusius an armadillo through the post, in some sense, he needn't have bothered.[56] Although, as we have seen, plants and animals often did not survive an overseas, or even an inter-European, trip, the late sixteenth century saw an increase in not only the interest in curiosities, but also in systematic efforts to collect and send them. There were countless natural objects that made this journey, and plenty of specimens, especially the hardier ones, eventually made it through.

An Armadillo in Every Cabinet:

If you were to walk into a learned man's cabinet of curiosities anywhere in Europe by the mid sixteenth century, you would have almost certainly seen an armadillo carapace. In a study of French cabinets of curiosities in the seventeenth century, Antoine Schnapper found that, while contents might have varied, all of them contained the "inevitable" armadillo.[57] Similarly, in her survey of ten cabinets of the same century, Wilma George found that every one of them also contained at least one armadillo.[58] The catalog of the rarities in the school of anatomy in Oxford in 1657 also noted that there was an armadillo

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[55] Barrera-Osorio, *Experiencing Nature*, p. 127.
[56] Letter from Castañeda to Clusius, 1600-10-20, UBL, VUL 101, Castañeda, 3.
[57] Antoine Schnapper, *Le Géant, la Licorne et la Tulipe: Les Cabinets de Curiosités en France au XVIIe Siécle* (Paris: Flammarion, 2012), pp. 69-70.
[58] Wilma George, "Alive or Dead: Zoological Collections in the Seventeenth Century," in *The Origins of Museums: The Cabinet of Curiosities in Sixteenth- and Seventeenth-Century Europe*, Arthur MacGregor and Oliver Impey, ed. (Oxford: Clarendon Press, 1987), pp. 180-181.

in the south part of the school, next to a sea urchin and a rhinoceros horn.[59] A 1681 catalog of the Gresham College collection belonging to the Royal Society had three different types, classified by analogy.[60] There was a "weesle-headed armadillo," a "pigheaded armadillo," and a "great shell'd hedgehog."[61] There were also plenty of armadillos for Clusius to visit in the Low Countries. The sale catalog of the collection of the French-born pharmacist Christiaen Porret, shows that his collection (which Clusius consulted several times when writing his encyclopedia of natural history) had one, as did the merchant and traveler Jan Huyghen van Linschoten, who gave one to his neighbor, physician and fellow collector Bernardus Paludanus.[62] Examinations of the illustrated frontispieces of published catalogs can turn into games of *Where's Waldo*, with a unmistakable curved carapace replacing a red and white striped shirt. Armadillos were points of pride for collectors—Ferrante Imperato, Ole Worm, and Fernardino Cospi all had large collections

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[59] Catalogus Rariorum in Schola Anatomica Oxoniensi, Bodleian Library, MS. Rawl. D.912, f. 204^{r}.

[60] For more on analogy, see chapter 1 of this dissertation.

[61] Nehemiah Grew, *Musaeum regalis societatis, or a catalogue and description of the natural and artificial rarities belonging to the Royal Society and preserved at Gresham Colledge* (London: W. Rawlins, 1681), pp. 17-20.

[62] *Catalogus Oft Register Vande Sonderling-Heden oft Rariteyten Ende Wtgelesen Sinnelickheden…* (Leiden: Jan Claesz van Dorp, 1628). For more on Porret and his collection, see Claudia Swan, "Making Sense of Medical Collections in Early Modern Holland: The Uses of Wonder," in *Making Knowledge in Early Modern Europe: Practices, Objects, and Texts, 1400-1800,* Pamela Smith and Benjamin Schmid, eds. (Chicago: University of Chicago Press, 2007), especially pp. 200-201. On early modern Dutch collecting in general, see Claudia Swan, "Collecting Naturalia in the Shadow of Early Modern Dutch Trade," in *Colonial Botany: Science, Commerce, and Politics in the Early Modern World,* Londa Schiebinger and Claudia Swan, eds. (Philadelphia: University of Pennsylvania Press, 2007), pp. 223-236. On Paludanus, see Friedrich W. T. Hunger, "Bernardus Paludanus (Berent ten Broecke), 1550-1633: Zijn verzamelingen en zijn werk," in *Itinerario, voyage, ofte Schipvaert van Jan Huygen van Linschoten naer Oost ofte Portugaels Indien, 1579-1592,* C. Burger and F. Hunger, eds. (The Hague: Nijhoff, 1934), pp. 249-268; Peter Mason, *Infelicities: Representations of the Exotic* (Baltimore: The Johns Hopkins University Press, 1998), pp. 79-81.

encompassing far more than could fit in one image; nevertheless, they put them on graphic display in the frontispieces of their published catalogs.[63] **[Figures 4.2-4.4]**

Armadillos even crossed the bounds of Europe. When the French naturalist Pierre Belon traveled with the French Ambassador to the Ottoman Empire in the 1550s, he went to a market in Constantinople where he "found many singularities brought from far-away lands," including theriac and its exotic ingredients, fish from the Nile, and "the animal that is called a Tatou."[64] Belon made it clear that this "type of hedgehog, unknown to the



Figure 4.2: Ferrante Imperato, *Dell'Historia Naturale,* 1599

[63] Ferrante Imperato, *Dell'historia naturale di Ferrante Imperato napolitano* (Naples: Costantino Vitale, 1599); Ole Worm, *Museum Wormianum, seu, Historia rerum rariorum* (Leiden: Iohannem Elsevirium, 1655); Lorenzo Legati, *Museo Cospiano annesso a quello del famoso Ulisse Aldrovandi* (Bologna: Per Giacomo Monti, 1677).

[64] "ay trouvée plusieurs singularitez apportées de estranges pays"; "l'animal […] qu'on nomme un Tatou, est trouvée dans leurs mains," Pierre Belon, *Les Observations de Plusieurs Singularitez et choses memorables, trouvées in Grece, Asie, Iudée, Egypte, Arabie, & autres pays estranges* (Paris: Gilles Corrozet, 1553), f. 209[v].

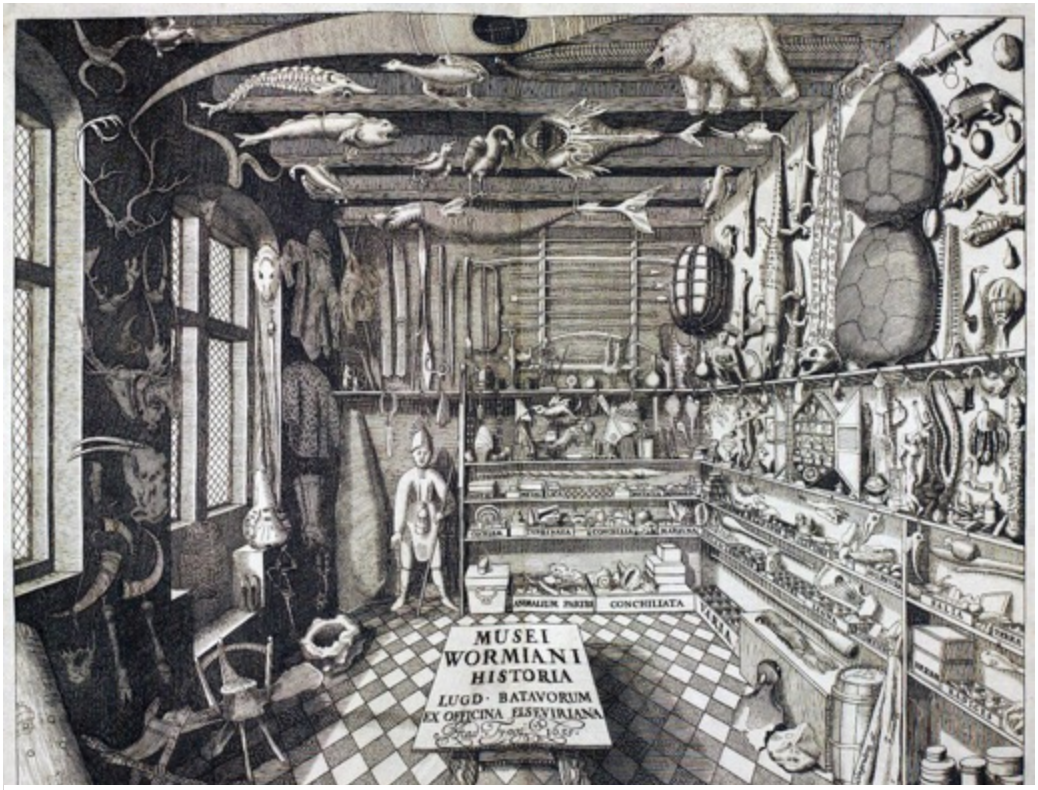

Figure 4.3: Ole Worm, *Museum Wormianum* (1655)



Figure 4.4: Lorenzo Legati, *Museo Cospiano,* 1677

ancients" was from the New World and had traveled from there to Constantinople. He had also seen one of these animals in Paris, this time, a live specimen that thrived on grains and fruit.[65] If they survived the sea voyage, this animal's indiscriminate diet made them good additions to menageries.[66] As a result, there were quite a few live specimens in Europe in the early modern period for people like Bellon to see. "Nevertheless," he told his readers who might not have had this same pleasure, "I thought it would be good to give its portrait."[67] **[Figure 4.5]** He possibly did not pay enough attention to the live specimen he saw, since the animal in the figure has a barred snout, a quirk of postmortem preparation

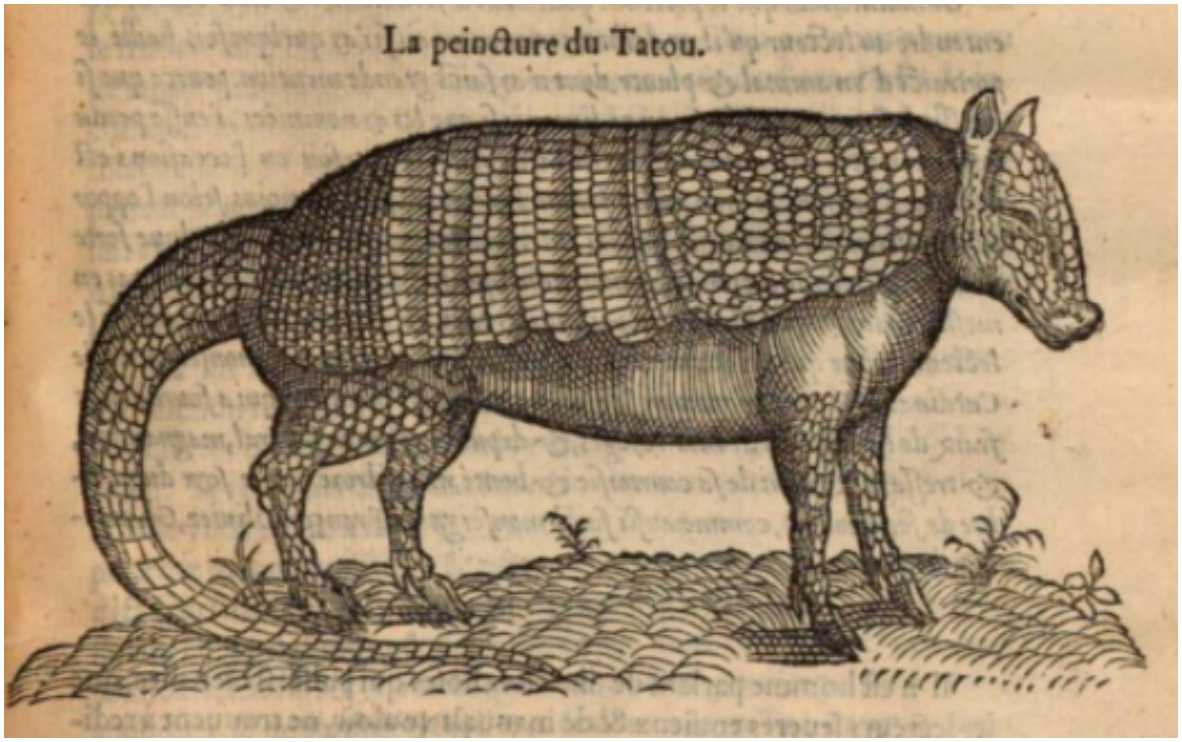

Figure 4.5: Pierre Belon, *Les Observations de Plusieurs Singularitez*, 1554

[65] "C'est une espece de Herisson qui les anciens n'ont pas cogneu," and he makes it clear in two places in the book that this is animal was "aportée du Bresil," and "apporté de la Guinée, & de la terre neuue," Belon, *Singularitez*, f. 5[r] and 209[v].
[66] K.H. Redford, "Food Habits of Armadillos (Xenartha: Dasypodidae)," in *The Evolution and Ecology of Armadillos, Sloths, and Vermilinguas,* ed. Gerald Gene Montgomery (Washington: Smithsonian Institution Press, 1985), pp. 429-437.
[67] "...neantmoins il m'a semblé bon d'en bailler le portraict," Belon, *Singularitez*, f. 209[v]-210[r].

for an animal whose lips recede into a snarl when they dry out.[68] Either as live animals eating fruit in a Paris home, offered for sale in a bazar in Constantinople, or on the pages of popular books, these animals were known far beyond the range their native habitats and were equally fascinating as living creatures for their unique habits and defense strategies as they were as dead specimens, when their carapaces proved to be valuable sources from which to make taxonomic critiques.

The increase in popularity and visibility of exotic animals in Europe corresponded with the rise in efforts to decipher their natural history. As María Portuondo argued, new things from the Americas from the New World had to be "accommodated into prevailing natural philosophical frameworks," and they had to be "'consumed' by a European intelligentsia who interpreted the world mostly through the hermeneutical lenses afforded by Aristotelian and in some cases Neoplatonic natural philosophies."[69] This was precisely what the naturalists did when confronted with animals like armadillos. As we have seen, naturalists had relatively easy access to these animals. As Belon explained, what made armadillos so common in so many cabinets of curiosities, and what made it possible for them to be brought so far from their native homes, was "because nature has armed them with hard skin like large plates of armor […] so that one can easily remove their skin without them losing their true form."[70] They are also opportunistic scavengers, so if they

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[68] My thanks to the staff at Prey Taxidermy in Los Angeles, CA for explaining this to me.
[69] María Portuondo, "America and the Hermeneutics of Nature in Renaissance Europe," in *Global Goods and the Spanish Empire, 1492-1824: Circulation, Resistance and Diversity*, Bethany Aram and Bartolomé Yun Casilla, eds. (Houndmills, Basingstoke, Hampshire: Palgrave Macmillan, 2014), pp. 78-99, quotation from p. 78.
[70] "Ce qui faict qu'on voit ceste beste ia co[m]mune en plusieurs cabinets, et ester portée en si lointain pais; est que nature i'a armée de dure escorse et larges escailles a la maniere d'un cocelet, et aussi qu'on peut aisement oster sa chair de leans sans rie[n] perdre de sa naifue figure," Belon, *Singularitez*, f. 210[r].

survived the journey, they would easily flourish as pets. On a practical level, therefore, these animals were attractive to collectors because of their durability and hardiness both living and dead. However, they were also appealing to those who delighted in their liminal status. Like many other American animals, they were odd, but what distinguished them from other New World fauna was their resistance to easy classification, throwing into relief the problems naturalists had in incorporating new animals into an older tradition of natural history. Now, it was up to these scholars to take these animals, the sometimes-conflicting information about them from a variety of sources that ranged from questionable to downright disingenuous, and the existing trends of scholarly studies of *naturalia* to rewrite the book of nature to take into account her newly expanded borders.

The Natural Histories

In ones and twos, dead and alive, American animals came to Europe. Their inclusion in cabinets of curiosities and other European collections was not merely decorative, however. These spaces were the sites of serious academic research, and as we saw in the previous section, the inter-European trade in of these animals was central to scholarly study.[71] Once they landed in the cabinets of the learned and curious, how were they sorted? In the era when armadillos made it to Europe, non-human (and non-insect) animals were classified into three broad groups: land animals, fish, and birds.[72] Quadrupeds lived on land, gave birth to live young, and had four limbs. Things that flew

[71] Paula Findlen, "Natural History," in *The Cambridge History of Science: Volume 3: Early Modern Science*, Katharine Park and Lorraine Daston, eds. (Cambridge: Cambridge University Press, 2006), pp. 435-468; Paula Findlen, "Anatomy Theaters, Botanical Gardens, and Natural History Collections," in *The Cambridge History of Science: Volume 3: Early Modern Science*, pp. 272-289.
[72] This broadly followed Pliny's classification, see Pliny the Elder, *Natural History: Books 8-11,* vol. 3 (Cambridge and London: Harvard University Press, 1983).

in the air, including bats, were classified as birds. Fishes roamed the seas, and included everything from sharks to whales, and, later on, manatees.

Cabinets of curiosities and early museums were classified along similar lines, although they often highlighted special objects that defied these earlier categorizations or arranged artifacts in an incongruous way. The arrangement of early modern museums, as Barbara Stafford argued, "turned the museum into a *theatrum* whose […] materials were accumulated in order to be looked at."[73] Objects were arranged in such a way so that this looking was directed, as it was in any theatre. Fernardino Cospi's museum, for example, was deliberately unorganized and displayed to "build visual bridges in order to emphasize the playfulness of nature," as Horst Bredekamp argued.[74] While the overarching organization of museums like Cospi's separated quadrupeds, fish, birds, and insects (and divided animals from plants and minerals), they nevertheless used certain items to highlight incongruity. Coral, for example, straddled the animal-vegetable-mineral divide, and rather than pick a place for it, collectors scattered it throughout the collection in conspicuous places, calling attention to its strangeness.[75] The same impetus led to collectors to display fish on the ceilings or upper cabinets of the museum, while birds were displayed below. The subversion of place, even while keeping animals grouped within their natural order, further stressed the cabinet of curiosities as a space to highlight challenges to accepted borderlines. Textual compilations also had to pick a place for all the

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[73] Barbara Marie Stafford, *Artful Science: Enlightenment Entertainment and the Eclipse of Visual Education* (Cambridge, MA: The MIT Press, 1994).
[74] Horst Bredekamp, *The Lure of Antiquity and the Cult of the Machine,* Allison Brown, tr. (Princeton: Markus Wiener Publishers, 1995), p. 73.
[75] Bredekamp wrote that in Cospi's museum, coral was "mixed with ancient vessels […] coins, prepare specimens, and utensils. […] They are not separated from one another and are instead allowed to mingle together. They are apparently combined in such a way as to play down the boundaries between them," Bredekamp, *Lure of Antiquity*, p. 73.

materials of creation, but unlike cabinets, where the conceptually confounding might be prized and put on special display, liminal objects proved problematic for the more static medium of text.

The categories of quadruped, fish, and birds were old ones, and all the animals known in Europe already had a neat place within them thanks to generations of texts devoted to animals. Bartolomeus Anglicus's 1240 *De proprietatibus rerum* included three books on the world's fauna (*De Avibus* on birds, *De Aqua* on fish, and *De Animalibus* on quadrupeds), and the works of other medieval compilers like Isidore of Seville, Johann von Cubem Konrad of Megenburg, Vincent de Beauvais, and others followed a similar pattern.[76] The large-scale compilers of encyclopedias of natural knowledge of the sixteenth century—men like Conrad Gessner, Ulisse Aldrovandi, and Carolus Clusius—also by and large kept to a similar model.[77] However, the imperfect and incomplete information they sometimes received, especially about newly discovered species, led to classificatory debates. As we saw in chapter 3, naturalists like Gonzalo Fernández de Oviedo and José de Acosta believed that to write the history (natural or otherwise) of something, one should have intimate knowledge of it. This was especially true, they reasoned, for something as alien as the New World, which had proved to have some striking

[76] On these medieval works of natural history and their classification schemes, see Wilma George and W. Brundson Yapp, *The Naming of the Beasts: Natural History in the Medieval Bestiary* (London, Duckworth, 1991).
[77] E. W. Gudger, "The Five Great Naturalists of the Sixteenth Century: Belon, Rondelet, Salviani, Gesner and Aldrovandi: A Chapter in the History of Ichthyology," *Isis* 22, no. 1 (1934): 21-40. For the use of the term 'encyclopedism' in the early modern period, see Ann Blair, "Revisiting Renaissance Encyclopaedism," in *Encyclopaedism from Antiquity to the Renaissance*, Jason König and Greg Woolfe, eds. (Cambridge: Cambridge University Press, 2013), pp. 377-397.

incongruities with previously uncontested knowledge.[78] Most European naturalists, however, did not have that luxury. Still, the natural world beckoned, and plants and animals—not just from the North American continent, but also from Asia, and even northern Europe— clamored to claim their place in the ark of European knowledge, and these compilers all attempted to corral the animals of the world onto the printed page, especially those that had as of yet escaped European attention. By looking at how these authors discussed challenging animals, we see the problems that New World animals presented, and the strategies that Europeans at home used to solve them.

Over the course of his life, Conrad Gessner, the Swiss physician, bibliographer, and general polymath amassed a huge store of knowledge about a variety of topics. A lifelong collector of *naturalia* and natural information, his books on natural history were as close an encapsulation of the entirety of European zoological knowledge as existed in the early modern period.[79] He classified animals—and in turn, his books—along familiar categories. The first volume of his *Historiae Animalium* came out in 1551 and described quadrupeds that gave birth to live young, followed by a 1554 book about their egg-laying counterparts.[80] The third book (1555) dealt with birds, and the following book (1558) was

[78] This was, of course, a problem within Europe as well, especially with regard to the divide between northern and southern Europe, see Ogilvie, *Science of Describing*, chapter 1.
[79] For a biographical work about Gesner and his many publications, see Hans H. Wellisch, *Conrad Gessner: A Bio-Bibliography* (Zug: IDC, 1984). For the most recent complete biography about Gesner, see Urs B. Leu, *Conrad Gessner (1516-1565): Universalgelehrter und Naturforscher der Renaissance* (Zurich: NZZ, 2016). For more on the current state of historical research on Conrad Gesner, see the articles in the first 2016 issue of *Gesnerus*, especially Philippe Glardon, "Gessner Studies: State of the Research and New Perspectives on 16th-Century Studies in Natural History," *Gesnerus 73*, no. 1 (2016).
[80] Conrad Gesner, *Historia Animalium liber I, de quadrupedibus viviparis* (Zurich: Christoffel Froschauer, 1551); Conrad Gesner, *Historia animalium liber II, de quadrupedibus oviparis* (Zurich: Christoffel Froschauer, 1554).

about fish.[81] The final work in his *Historiae Animalium* was on serpents and was published posthumously in 1587. He planned a sixth book on insects, though he only completed one section of it before his death.[82]

We might expect that Gesner's armadillo would have had a place in his 1551 *De Quadrupedibus Viviparis,* but that was not initially the case. Instead, it was added to an appendix to *De Quadrupedibus Oviparis*, published four years later.[83] In the appendix's letter to the reader, he noted that, after the first edition, some "most renowned men" sent him both images and textual information about foreign animals.[84] Although these additions eventually made their way into their categorically appropriate books, he also received some information about animals that either were meant for the 1551 *De quadrupedibus viviparis*, or did belong in book II (the book to which the appendix was appended), but which he received after the sections to which they belonged were already damp off the press. Also, most of the thirty entries in the appendix were not, in fact, wholly absent from the original book. Instead, they offered supplemental information for animals about which Gesner had already published. For example, Gesner noted that he already discussed the *bonasus* on page 145 of book I of his *Historiae* in his discussion of wild cattle, but that his friend John Caius sent him another picture of its horns, one that contradicted what

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[81] Conrad Gesner, *Historiae animalium liber III, qui est de avium natura* (Zurich: Christoffel Froschauer, 1555); The book on fishes was mainly a reprint and Latin translation of two works on fishes by Guillaume Rondelet and Pierre Bellon, Conrad Gesner, *Historiae animalium liber IIII, qui est de piscium & aquatilium animantium natura* (Zurich: Christoffel Froschauer, 1558).
[82] Conrad Gesner, Jacobus Carronus, and Caspar Wolf, *Historiae animalium Lib. V qui est de Serpentium natura* (Zurich: Christoffel Froschauer, 1587). Gesner's notes on the scorpion were added to this book with a seperate title page.
[83] Conrad Gesner, "Appendix Historiae Quadrupedum Viviparorum," in *Historia Animalium Liber II, De Quadrupedibus Oviparis* (Zurich: Christoffel Froschauer, 1554), pp. 1-27.
[84] "A primo igitur Historiae Animalium nostrae aedito libro, pervenerunt ad me imagines aliquot et historiae simul quorundam peregrinorum Animalium (in Quadrupedum genere, nam de caeteris in prescencia non dicam) quae comminicarunt clarissimi viri," Gesner, "Appendix Historiae Quadrupedum Viviparorum," in *Historia Animalium Liber II*, p. 1.

Gesner had previously published.[85] It was not just from friends that he gathered new information—after reading Hector Boethius's description of the kings of Scotland, Gesner instructed the reader to add three new types of Scottish dogs to the *canis* section.[86] He also added more information to conceptually problematic animals like hyenas, unicorns, and satyrs.[87] Other times, however, the additions were truly were press-stopping novelties that simply had not existed in the earlier work. This reflected both Gesner's working process and the nature of early modern natural history as discipline in flux, with new information, and even new animals, constantly making their way into scholarly works at inopportune times.[88]

Most of the animals in the appendix that were new additions to the text (rather than emendations or clarifications upon it) were from the New World, including the *tatu*, which he did not (in this version, at least) call an armadillo. In his description, Gesner relied almost exclusively on (and the text was almost verbatim from) Pierre Belon's *Observations De Plusieurs Singularitez*. He did, however, take issue with Belon's image. Gesner argued that, in his book, the latter had "put forth a picture of this quadruped as a cloven-footed animal, as if it were a swine, and legs that are higher than in our picture, and

[85] Gesner, "Appendix Historiae Quadrupedum Viviparorum," *Historia Animalium Liber II*, p. 5. For more on the relationship between Caius and Gesner, see Anthony Grafton, "Philological and Artisanal Knowledge Making in Renaissance Natural History: A Study in Cultures of Knowledge," *History of Humanities* 3, no. 1 (2018): 39-55.
[86] Gesner, "Appendix Historiae Quadrupedum Viviparorum," in *Historia Animalium Liber II*, pp. 13-14.
[87] The section on the unicorn is on pp. 12-13; the hyena on pp. 20-21; the cynocephalus and the satyr on p. 16, Gesner, "Appendix Historiae Quadrupedum Viviparorum," in *Historia Animalium Liber II*.
[88] For more on Gesner's writing process, see Ann Blair, "Conrad Gessner's Paratexts," *Gesnerus* 73, no. 1 (2016): 73-122.

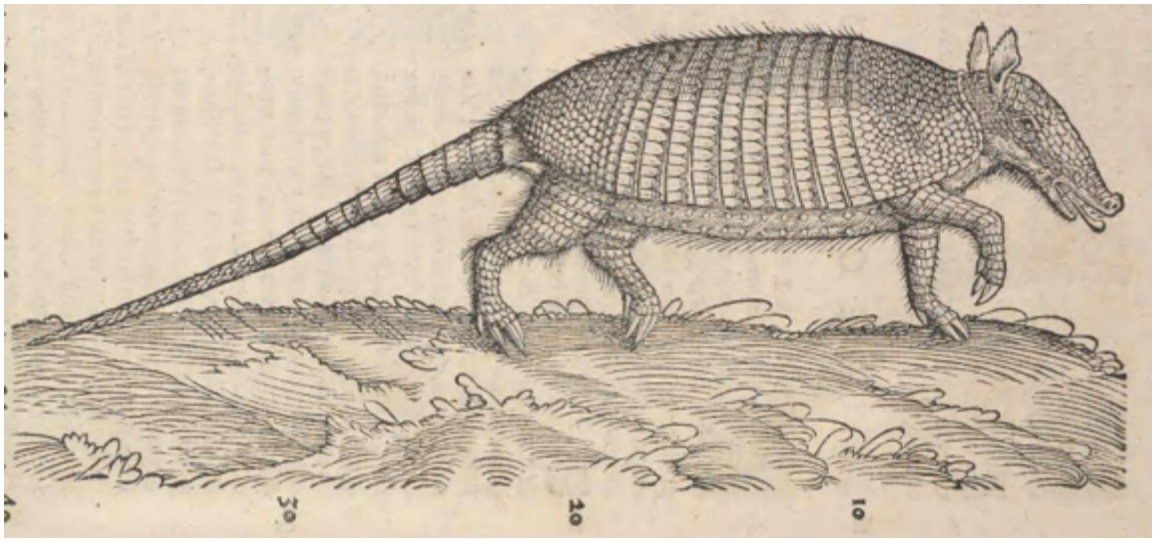

Figure 4.6: Conrad Gesner, Appendix to *Historiae Quadrupedum*, 1554

also a different mouth."[89] **[Figures 4.5 and 4.6]** Where did Gesner get his information, and his assurances that Belon who—as he wrote in the *Singularitez*—had seen at least one live specimen, was incorrect? Gesner, like Clusius and virtually all naturalists of his era, had a large correspondence network from whom he received information about everything from anteaters to zebras. Unsurprisingly, many of his correspondents were men with medical interests, including Adrianus Marsilius.[90] This "illustrious pharmacist from Ulm," Gesner wrote, sent him "the skin itself, the tail, and the legs of this animal." It was from these pieces that he recreated what he called a "most correct picture" that eventually went

[89] "Bellonius in libro Gallico memorabilium rerum quas peregrinando observavit ubi etiam huius quadrupedis figura[m] proponit, bisulcis pedibus ut in sue, et curibus quam in nostra figura altioribus, et rictu etiam alio," Gesner, "Appendix Historiae Quadrupedum Viviparorum," in *Historia Animalium Liber II*, pp. 19-20.
[90] Of the thirty-six of Gesner's correspondents for the *Historiae Animalium* whose professions are known, Masilius was the only apothocary, but there were thirty-three physicians total. The rest were either theologians, professors, lawyers, or printers. For more on Gesner's correspondents, see Ogilvie, *Science of Describing*, pp. 34-35.

first into the appendix, then into the second edition of the *Historiae Animalium de quadrupedibus viviparis.*[91]

As Claudia Swan argued, drawing from life as a mode not just of representation but of legitimation grew in popularity in the sixteenth and seventeenth centuries.[92] Gesner specifically wrote that he drew from the pieces of armadillo that he had at his disposal, and by extension, he took legitimacy from drawing, if not truly *ad vivum*, at least from a previously living specimen. From the dismembered corpse at his disposal, he was able to determine that "the feet in this animal are not cloven, but digitated: with five digits in the back feet, and four digits in the front feet: indeed, the two farthest are each the shortest, and they are almost hidden."[93] This is something that is difficult to see—especially on their back feet, an armadillo's toes grow very close together, and the first and fifth toe, while separate, as Gesner found, are very small.[94] A cursory glance at a dried armadillo in a cabinet, coupled with the idea of these animals as being pig-like, no doubt led many to the conclusion that, like their porcine look-alikes, they had cloven hooves. Because Gesner had a specimen to examine at length, he was able to correct Bellon's image, and in doing so, he also changed an overall taxonomical classification in animals: whether or not they were cloven-footed.

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[91] "Nostram quide[m] egregius vir Adrianus Marsilius [...] Pharmacopola Ulme[n]sis ad me misit, una cum cortice ipso, cauda & cruribus huius animalis, unde picturam quoq[ue] rectissime opera eius expressam omnino apparet," Gesner, "Appendix Historiae Quadrupedum Viviparorum," in *Historia Animalium Liber II*, p. 20.
[92] Claudia Swan, "*Ad vivum, naer het leven*, From the Life: Defining a Mode of Representation," *Word & Image* 11, no. 4 (1995): 353-372.
[93] Gesner, "Appendix Historiae Quadrupedum Viviparorum," in *Historia Animalium Liber II*, p. 20.
[94] F. Wallace Taber, "Contribution on the Life History and Ecology of the Nine-Banded Armadillo," *Journal of Mammalogy* 26, no. 3 (1945): 211-226.

At the same time, however, Gesner likely received a specimen that had been dried out long before he had a chance to examine the carapace. As a result, the exaggerated gaping mouth that Gesner believed was a correction to Bellon's figure was instead an artifact—a result of time and dehydration peeling the animal's thin lips away from the bone of its snout and into the snarl so characteristic (and characteristically mistaken) of representations of this animal in the early modern period. Belon, who had seen a live animal, would have known that the animal's mouth closed fully, but his image was drawn from memory, not life, and was thus epistemologically suspect. When faced with a conflicting fact, even one from a person who claimed to have seen the real thing rooting around in a Parisian courtyard, Gesner still had to rely on the evidence provided by the object in front of him. And since animals traveled better dead than alive, Gesner's specimen, like so many others in Europe from which naturalists illustrated, had this same artifact. The ability to examine the carapace closely led Gesner to make a few assumptions about its nature—some of which (like the structure of its feet) track with contemporary zoological understanding, and others (like the open mouth), which do not. Nevertheless, he thought that, through close examination of the specimen itself, he could correctly classify this new animal.

Ulisse Aldrovandi's output was at once more voluminous—and more fragmented—than Gesner's.[95] He is perfectly encapsulated by Elizabeth Yale's observation that, in this period, "naturalists […] wrote more than they could ever hope to print."[96] He gathered both natural specimens and slips of paper describing them, intending to become the next

[95] For more on Aldrovandi and his natural history, see Findlen, *Possessing Nature*.
[96] Elizabeth Yale, "With Slips and Scraps: How Early Modern Naturalists Invented the Archive," *Book History* 12 (2009), p. 10.

Pliny or Aristotle with the written output of his research. Death caught him short, however, and while he did see his books on birds and insects through the press, the bulk of his work was published only posthumously.[97] In organizing what he planned to be a universal and comprehensive natural history, Aldrovandi also grouped his works into categories broadly similar to Gesner's: quadrupeds, fish, birds, serpents, and insects. In the introduction to his 1637 *De Quadrupedibus digitatis viviparis*, he discussed how this classificatory scheme appeared in everything from sacred literature to the works of the ancient Greeks, but that there were often contradictions in them, and some of the finer breakdowns in these earlier classification systems had problems.[98] He wrote that Galen, for example, classified animals as being either oviparous or viviparous, and wrote that all oviparous animals were covered with a protective body, and that viviparous ones were covered in hair. For Aldrovandi, this was a clear problem—the hedgehog and the porcupine's coverings hardly seemed like hair.[99] So, in his revised scheme, he classified quadrupeds into three categories: those with cloven hoofs, solid hoofs, or those with digits. Only *after* he had settled what he thought was a more fundamental distinction did he divide animals up into either viviparous or oviparous sections. Gesner, who only separated quadrupeds by their mode of reproduction, saw the issue of armadillo's feet as a curious puzzle, but for Aldrovandi, this uncertainty represented a huge classificatory problem.

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[97] Although he planned to publish a completed, univeral natural history, he only published preliminary books on birds and insects in his lifetime, Ulisse Aldrovandi, *De animalibus insectis libri septem: cum singulorum iconibus ad viuum expressis* (Bologna: Giovanni Battista Bellagamba, 1602); Ulisse Aldrovandi, *Ornithologiae hoc est de avibus historiae libri 12* (Bologna: Franciscum de Franciscis Senensem, 1599).

[98] "Ordinis Ratio," in Ulisse Aldrovandi, *De quadrupedibus digitatis viviparis libri tres, et de quadrupedibus digitatis oviparis libri duo* (Bologna: Nicolai Tebaldini, 1637), pp. 1-2.

[99] "Ovipara cortice teguntur, vivipara pilis induuntur, Echinus tamen, & Hystrix cuius pellite loco aculeis armantur," Aldrovandi, *De quadrupedibus digitatis viviparis*, p. 1.

Despite his best efforts to get to the American continent, Aldrovandi was, like Clusius and Gesner, an armchair naturalist, and he had to wade his way through the mass of sometimes contradictory descriptions from authors with varying levels of credibility or observational skills. This directly impacted Aldrovandi's simplest choice about what he called a "*tatu,* or Brazilian Hedgehog": where should it go? He had done his research. In the beginning of his armadillo entry, he noted that various authors had given it several names in the past century that the animal was known in Europe. He wrote that Oviedo called it a *bardato* because it was covered by full armor, and that Peter Martyr had called it *phaleratum* because it looked like a horse, and that some of his contemporaries also called it a "checkered piglet" because of the shape of its face and its shell.[100] These descriptions compared it to a horse and a pig, both cloven-hoofed animals. However, the *tatu* was not in Aldrovandi's De *Quadrupedum Omnium Bisulcorum Historia*, but in his *De Quadrupedibus Digitatis*. What he read in Bellon would have added more evidence for classifying armadillos as bisulcate animals because, as Aldrovandi himself stated, that author described a cloven-footed animal. If one looked at Bellon, Aldrovandi argued, "this animal would be put in the group of cloven-footed animals, and not in the group of digitate animals." This, however, was something that Gesner soundly rejected, since he only observed armadillos with toes.[101] It is true, he continued, that it was a common mistake to

[100] "Oviedus … Bardato, nempe panoplia, scilicet integra armatura munitum appellavit," Aldrovandi, *De quadrupedibus digitatis viviparis libri tres*, p. 478. None of Oviedo's published or manuscript sources call this animal a bardato—he instead called in an encubertado. This is not the only misidentification Aldrovandi made—he also asserted that Giovanni Pietro Maffei called it a "Tartusia," though Maffei follows all other authors in calling it a Tatu; "Hodie Auctores Nuperi […] a figura rostri, et a tegumento pocellum scutulatum nominant," Aldrovandi, *De quadrupedibus digitatis viviparis*, p. 478.

[101] "Si contemplemus differentias Bellonius in Observationibus Hodaeporicis, hoc animal cum pedibus bisulcis momoravit. Quare hoc animal in genere bisulcorum, et in genere digitatorum

think of these animals as cloven-footed, since the animal had five toes on its back feet (including one somewhat hidden dewclaw), and four toes on its front feet, but that its digits "are very small on either side of the foot, and curl inwardly so that they can be retracted, as almost to escape notice."[102] So, while he sided with Gesner, who "established that it was a viviparous quadruped, and a species of Brazilian hedgehog," he went further to explicitly state that it was digitate, something that Gesner did not dispute, but which was not part of his overall classification scheme, thus something of only ancillary importance.[103]

Although Aldrovandi cited ten authors in his entry on the armadillo (Oviedo, Maffei, Clusius, Monardes, Gesner, Scaliger, Acosta, Léry, Cameriarus, and Gomara) he focused most on those authors who had provided images of digitate creatures: Monardes, Gesner, and Clusius. These textual practices were not incongruous with his emphasis on observation. Instead, as Fabien Kramer argued, Aldrovandi's "scholarly practices of reading, taking notes, and writing were tied in with, and essential to, his observational practices."[104] Furthermore, he used lists of materials from other scholars as a way to create consensus by exhaustive comparison. His list of authorities included travelers, physicians, encyclopedists, and humanist scholars. From the information and expertise of all of these people, he created a composite consensus from textual sources, even as he privileged

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constitueretur quod Gesnerus loco praecitato reprobat," Aldrovandi, *De quadrupedibus digitatis viviparis*, p. 479.

[102] "...digitos quinos in posterioribus, et quateros in anterioribus pedibus, deinde extremi utrobique brevissimi sunt, et introrsum, ita reducti, ut fere lateant, ungibus tamen satis validis armantur," Aldrovandi, *De quadrupedibus digitatis viviparis libri tres*, p. 479.

[103] "Gesnerus in appendice Quadrupedum viviparorum spciem Herinacei Brasiliani constituit,"" Aldrovandi, *De quadrupedibus digitatis viviparis libri tres,* p. 478.

[104] Fabien Kramer, "Ulisse Aldrovandi's *Pandechion Epistemonicon* and the Use of Paper Technology in Renaissance Natural History," in *Early Science and Medicine* 19, no. 5 (2014): 398-423, quotation from p. 403.

accounts that included images rather than those that only provided text.[105] As Daniella Bleichmar argued, the watercolor image of an armadillo that Aldrovandi used when he was preparing his manuscript was clearly based on (although not an exact copy of) the Gesner armadillo.[106] Also, in discussing Clusius's contribution to the natural history of this animal, Aldrovandi noted that he "understood from men worthy of trust that there existed three species of Tatu." Clusius's first species, he continued, was large, and "as one may see in the image put together in his annotations to Monardes, […] seems to coincide with the likeness shown here by us."[107] The second was simply a smaller version of the first, he continued, but "the third is different from the previous ones in form," and, for want of a physical specimen, Clusius could only describe it from a picture.[108] Zoological illustrations were important for Aldrovandi, who used images not just as exemplars in creating his own figures, but as a source of information in their own right, especially for classification.

"We can testify," Aldrovandi told the reader, that both Clusius' and Gesner's descriptions (and in turn, illustrations) "conforms to the truth, since the undamaged outer covering of this animal are found in the treasury of natural things of the most illustrious senate of Bologna."[109] However, the exuviae he had access to did not include the feet, so he had to rely both the texts and images of others to make what for him was an important

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[105] For more on Aldrovandi's use of lists, see Kraemer, "Ulisse Aldrovandi's *Pandechion Epistemonicon*," pp. 409-411.
[106] Daniela Bleichmar, *Visual Voyages: Images of Latin American Nature from Columbus to Darwin* (New Haven: Yale University Press, 2017), pp. 17-20.
[107] "… quod Clusius in Exoticis refert, se intellexisse a viris fide dignatis, Tatu tres species assignari, quarum prima est magna, ut licet conspicari in figura collocata in Annotationibus ad Monardem, quae cum icone a nobis his exhibita coincidere videtur,"Aldrovandi, *De quadrupedibus digitatis viviparis*, p. 479.
[108] "Tertia a praedictis forma est diversa," Aldrovandi, *De quadrupedibus digitatis viviparis*, p. 479.
[109] "Haec desciptionem veritati conformem esse testificati possumus, cum animalis huius exuviae in rerum naturalim penu ilustriss. senatus Bonononiensis adhuc illesae seruentur," Aldrovandi, *De quadrupedibus digitatis viviparis*, p. 479.

distinction. In turn, in the *De Quadrupedibus Digitatis*, when Aldrovandi refers to his figure, he makes sure to clarify that, "in the animal whose image we put forth here," there should be a certain number of digits, "unless the painter will leave something out."[110] While Aldrovandi did take Gesner's information, he certainly did not take over his categorization model, and he explicitly rejected Gesner's alphabetical approach to ordering the living world, choosing instead to focus on morphological characteristics to make a more fine-grained approach to classification.[111] Aldrovandi was faced with conflicting reports in order to decide how to classify this animal, but in the end, he based his decision on the armadillo's outer appearance—in his case, that of its feet—and on what he perceived was its morphological similarity to animals like hedgehogs.

While Aldrovandi had to grapple with the choice of classifying the armadillo as an odd-toed ungulate or a digitate animal, other authors sometimes disagreed on a more fundamental division. If we return to the poem that opened this chapter, we see that Powers contended that if one went by the shape of their snouts and the noise they made, armadillos could unproblematically be quadrupeds. But, if one went by their scales and the ease with which they swam underwater, then they were piscine. And, indeed, plenty of authors took the later route: for example, Bernardino de Sahagún, a Franciscan friar who compiled the *Historia general de las cosas de la Nueva España* sometime between 1540 and 1585. His book, a massive 12-volume text in both Spanish and Nahuatl, devoted one volume to "earthly things," including the region's animals. His material for this section came not only from his own experience, but also from information that he had gathered

[110] "nisi Pictor aliquid omiserit," Aldrovandi, *De quadrupedibus digitatis viviparis*, p. 479.
[111] For more on this point, see Angelica Groom, *Exotic Animals in the Art and Culture of the Medici Court in Florence* (Leiden: Brill, 2018), p. 223.

from his Amerindian interlocutors, and the many drawings he included were created by indigenous artists.[112] He divided the animals into the three then standard categories: animals, birds, and fish. It was in the third chapter, on the "animals of the sea," that Sahagún placed "the animal that they call the armored one," right after other freshwater fish.[113] In putting the armadillo in the category of water animal, Sahagún likely followed an indigenous classification of animals. That might also explain why "water birds that always land in water" are also in this section.[114] It is possible Sahagún's classification was part of his goal of preserving indigenous knowledge, but other authors, ones who likely did not have access to indigenous knowledge, did something similar.

In 1577, Adriaen Coenensz, a Dutch fisherman and fish auctioneer began work on his *Vis Booc*, a compendium of the wonderous creatures that teemed in and around the sea. The manuscript described wonderous events like whales washing ashore and wonderful creatures like mermaids, but also our now familiar armadillo. It even had quite a few American animals, including the Patagonian *ou*, the manatee, and even a Peruvian cyclops.[115] Nevertheless, the placement of the armadillo suggests that Coenensz envisioned it as an amphibious link that tied together land and water lizards, as it was flanked on the

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[112] Charles E. Dibble, "Sahagún's Historia," in *Florentine Codex: A General History of the Things of New Spain Book 1: Introduction and Indices*, Arthur J. O. Anderson and Charles E. Dibble, eds. And trs. (Santa Fe, NM: The School of American Research and the University of Utah, 1982), pp. 9-23; Arthur J. O. Anderson, "Sahagún: Career and Character," in *Florentine Codex, Book* 1, pp. 29-41. The best-known manuscript of this work is the Florentine Codex, so named because it is held in the Laurentian Library of Florence. A digital facsimile can be accessed at www.wdl.org/es/item/10622/.

[113] "del animalejo que llaman el armado," *Florentine Codex*, f. 65^{r}.

[114] "Aves del agua que siempre moran en ella," *Florentine Codex*, f. 60^{v}. In European taxonomy, things that flew (a category that included bats, barn owls, and barnacle geese), regardless of their habitat, were always birds and never fishes.

[115] On the Americana in this work, see Florike Egmond and Peter Mason, "Armadillos in Unlikely Places: Some Unpublished Sixteenth-Century Sources for New World 'Rezeptionsgeschichte' in Northern Europe," *Ibero-amerikanisches Archiv*, Neue Folge, 20, no. 1/2 (1994): 3-52.

preceding page by a winged chameleon and two types of lizards, and on the other page, a pair of water lizards.[116]

Coenensz was not the only one to think of this animal as a bridge between land and sea. The French merchant Léonard Bernon had quite a few armadillos in his collection, as would befit any wealthy merchant, but it was their placement that was somewhat surprising. In the section of his catalog dedicated to amphibians, he noted that he had the usual suspects: American caimans, turtles, Egyptian crocodiles, but also "a whole armadillo, which are very rare" and "three beautiful tatous."[117] On the other hand, the "beautiful skin of an American serpent, six feet long, and one foot wide," a Brazilian lizard, and two chameleons (one alive, one dead) were classified with the terrestrial animals.[118] Sometimes, these animals skipped around, even within one particular cabinet. In 1587, when an armadillo was brought to the Escorial, a Spanish royal palace, it was accompanied by an explanatory note: "this is the hide of the animal that they call the armadillo. It is covered all over with shells, and because of this, it is said to be an animal of the sea as well as of land," though it was described elsewhere in the same catalog as a land animal.[119] Collections could be more accommodating than texts, because animals could

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[116] Adrian Coenen, Vis Booc, Koninklijke Bibliotheek (KB), f. 245^{v}. A digital facsimile can be accessed at https://galerij.kb.nl/kb.html#/en/visboek

[117] "L'Armadill en son entire, lequel est fort rate," and "trois Tatoux fort beaux," Leonard Bernon, *Recueil des Pieces Curieuses apportées des Indes, d'Egypte et d'Ethiopie, qui se trouvent dans le Cabinet de Leonard Bernon, sieur de Bernonville, à la Rochelle* (Paris: Gentil, 1670), p. 3. On the possible distinctions between armadillos and tatous in the seventeenth century, see Schnapper, *Le Géant, la Licorne et la Tulipe,* p. 70.

[118] *Recueil des Pieces Curieuses apportées des Indes*, pp. 4-5.

[119] "…pellejo de animal que llaman armadillo, cubierto todo de conchas, que dizen ser animal de mar y tierra, y que los hay en et Pirú," quoted in José Miguel Morán and Fernando Checa Cremades, *El Coleccionismo en España: De la Cámara de Maravillas a la Galería de Pinturas* (Madrid: Cátedra, 1985), p. 107.

more easily move (or be in two places at once) within the cabinet, though with texts, naturalists had to choose a place on the page for every animal a book described.

Nevertheless, even though they had more freedom, collectors with cabinets (like their encyclopedia-writing counterparts) struggled with pinning down the exact nature of the armadillo. Was it an aquatic creature like the turtles with whom it shared a shell? Was it a cloven-footed animal like the swine it so resembled? Questions of classification proved difficult not just for armadillos, but also for iguanas, manatees, opossums, and several other American animals. As more and more of them came into the New World, the process of classification became more of a problem. Classificatory schemes that had ossified in Europe over centuries were not well equipped to handle new entries, and in cabinets as well as written works, naturalists needed to find a place for not just the armadillos, but all the other conceptually difficult animals from the American continent. However, this tension did not immediately cause a reconfiguration in how Europeans thought about animals—either in classificatory frameworks or what other information was relevant about animals.[120]

A New Emblematics

While authors of natural histories struggled over where to place these animals in the ever-expanding book of nature, this distinctly modern concern did not obviate an older form of understanding animals—their symbolic presence. Several authors have identified the era in which Gesner, Clusius, Aldrovandi, and others were debating the place of the

[120] These issues were still up for debate well into the nineteenth century, especially for large sea mammals, see D. Graham Burnett, *Trying Leviathan: The Nineteenth Century New York Court Case That Put the Whale on Trial and Challenged the Order of Nature* (Princeton and Oxford: Princeton University Press, 2007).

armadillo as the era when natural history became modern. In his work on English naturalists, Charles Raven asserted that it was in the seventeenth century that "little by little nonsense was recognised, fables were exploded, superstitions were unmasked," and an older worldview withered in the face of "a refusal to accept tradition on authority and in an insistence that statements must be based upon observation and capable of verification."[121] In his work on animals in the early modern period, William Ashworth, following the work of Michel Foucault, also identified the end of the sixteenth century as the era of the fall of the emblematic worldview, where the discovery of the American continent revealed the shortcomings of that way of thinking. He also concluded that the "demise of emblematic natural history was a crucial part of the development of what we call the Scientific Revolution," and a "broader cultural shift that had profound consequences for the evolution of seventeenth century science."[122] Ashworth praised Gesner's willingness to "break with his carefully worked out format," where certain sections of the *Historiae Animalium* were committed to philological exploration. In another work, Ashworth suggested that this is the result of his "innovation […] to supplement his

[121] Charles E. Raven, *English Naturalists from Neckham to Ray: A Study of the Making of the Modern World* (Cambridge: Cambridge University Press, 1947), pp. 227-247, quotation from p. 227.
[122] William B. Ashworth, "Natural History and the Emblematic World View," in *Reappraisals of the Scientific Revolution*, David C. Lindberg and Robert S. Westman, eds. (Cambridge: Cambridge University Press, 1990), p. 305; Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (New York: Vintage Books, 1994). Some historians have pushed back against such stark pronouncements, Erika Fudge discusses the persistence of fables in the zoological works of the seventeenth century, see Erica Fudge, *Perceiving Animals: Humans and Beasts in Early Modern English Culture* (Urbana: University of Illinois Press, 2002), chapter 4; E.C. Spary has done similar work with enlightenment natural history and its use in reinforcing social norms, E. C. Spary, "The "Nature" of Enlightenment," in *The Sciences in Enlightened Europe,* William Clark, Jan Golinski, and Simon Schafer, eds. (Chicago: University of Chicago Press, 1999), pp. 296-298; as has Robbins, *Elephant Slaves and Pampered Parrots*, pp. 177-185.

classical scholarship with observations and stories from contemporary observers."[123] Nevertheless, we do see that, in this period, scholars were still trying to give animals emblematic meanings so that they might better fit older styles of doing natural history.

That an animal took up a symbolic presence was not uncommon—many scholars have commented on the emblematic uses of animals in the medieval and early modern eras.[124] Ashworth, however, has argued that the incorporation of New World animals into late sixteenth and seventeenth century works of natural history sounded the death knell for the emblematic worldview, since American animals owed no legacy to the classical tradition.[125] However, if, as Emma Spary counsels in her work on Enlightenment natural history, we look at the "individuals who traded in notions of nature" rather than take as representative the work of a few published books of natural history whose work looks familiarly 'scientific' to our modern eyes, we see a different story.[126] While it is true that natural histories like those written by Clusius, Aldrovandi, or Gesner did not incorporate emblematics into New World animal descriptions to the same degree that they did for their Old World counterparts, it was not due to a rejection of that genre. Rather, the pace of accumulation of knowledge was slow, and while learning about an animal's physical

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[123] Willian B. Ashworth Jr, "Emblematic Natural History of the Renaissance," in *Cultures of Natural History*, ed. Nicholas Jardine, James A. Secord, and Emma C. Spary (Cambridge: Cambridge University Press, 1996), pp. 27-28.
[124] For the medieval bestiary tradition, see Willene B. Clark and Meradith T. McMunn, eds., *Beasts and Birds of the Middle Ages: The Bestiary and its Legacy* (Philadelphia: University of Pennsylvania Press, 1989); Debra Higgs Strickland, *The Mark of the Beast: The Medieval Bestiary in Art, Life, and Literature* (New York: Garland, 1999). For the emblematic tradition in the genre of sacred theology, see Peter Harrison, "The Virtues of Animals in Seventeenth-Century Thought," *Journal of the History of Ideas* 59, no. 3 (1998); Vibeke Roggen, "Biology and Theology in Franzius' *Historia Animalium Sacra* (1612)," in *Early Modern Zoology: The Construction of Animals in Science, Literature and the Visual Arts*, Karl A.E. Enenkel and Paul J. Smith, eds. (Leiden: Brill, 2007).
[125] Ashworth, "Natural History and the Emblematic World View."
[126] Spary, "The "Nature" of Enlightenment," p. 272.

appearance was easy, untangling its emblematic associations was not. If we turn away from works of natural history and towards books of emblems, we see multiple attempts to clothe American animals with classical references in such a way that they would not look out of place in the bestiary tradition that naturalists had inherited from their medieval predecessors.

The botanist and physician Joachim Camerarius was one such scholar who undertook a scholarly moralistic study of the natural world in the late sixteenth century. His *Symbola et Emblemata* was a series of four emblem books—one on plants, another on quadrupeds, the third on air-dwelling animals, with the final posthumous book on aquatic animals—that explored the allegorical significance of the natural world.[127] His work represented as earnest a scholarly endeavor as the encyclopedias of Clusius, Gesner, or Aldrovandi. The genre of emblem books itself was a relatively new invention—in 1531, the lawyer Andrea Alciato compiled a manuscript of short epigrams and illustrations, a piece of erudite humanist recreation meant for his similarly learned friends. The manuscript was published in 1531, and the resulting book was the text that launched a thousand emblem books, including Camerarius's *Symbola et Emblemata*.[128] For the latter, each book, or *centuria*, contained 100 entries, and each entry consisted of a motto, a moralistic epigram, an engraving that embodied that motto or epigram, and a page of prose that provided

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[127] Joachim Camerarius, *Symbolorum & emblematum ex re herbaria desumtorvm centuria una* (Nuremberg: Johannes Hoffmann and Hubert Camoxius, 1590 [1593]); Joachim Camerarius, *Symbolorum et Emblematum ex animalibus quadrupedibus desumptorum centuria altera* (Nuremberg: Johannes Hoffmann and Hubert Camoxius, 1595); Joachim Camerarius, *Symbolorum et Emblematum ex volatibilibus et insectis desumptorum centuria tertia* (Nuremberg: Johannes Hoffmann and Hubert Camoxius, 1596); Joachim Camerarius, *Symbolorum et Emblematum ex aquatilibus et reptilibus desumptorum centuria quarta* (Nuremberg: Johannes Hoffmann and Hubert Camoxius 1604).

[128] Andrea Alciato, *Emblematum Liber* (Augsburg: Heinrich Steyner, 1531). On Alciato's publication history, see John Manning, *The Emblem* (London: Reaktion, 2002), pp. 39-39.

information about the animal in question.[129] Camerarius, as Ashworth has argued, was "as much a student of nature as Gesner," and his output was familiar to those who understood the archetypical natural history of animals as a bestiary.[130]

Like other works in that genre, Camerarius's *Emblemata* took the moralistic and emblematic associations of animals seriously. Also, just as it was a continuation of the bestiary tradition in its content (though the genre of the emblem book itself was new), so too did it follow traditional models of classification. Thus, chameleons and crocodiles rub shoulders with cats and castors in the book dedicated to quadrupeds. However, this did not mean that Camerarius was any less troubled by problems of classification. He put both crocodiles and turtles, for example, in both his book on quadrupeds and his later book on water-dwelling animals, suggesting that he too grappled with where to place liminal animals. In his entry in the *Symbolorum et Emblematum ex aquatilibus*, he noted that crocodiles were "animals at the same time terrestrial and aquatic," and that while he had described them in his second book on quadrupeds, further study suggested to him that they were better classified as an aquatic animal than a terrestrial one.[131] Other animals similarly resided in two books, suggesting that Camerarius shared with other naturalists

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[129] For more on Camerarius's emblem books, see Karl Enenkel, "Camerarius's Quadrupeds (1595): A Plinius Emblematicus as a Mirror of Princes," in *Emblems and the Natural World (1500-1700)*, Karl A.E. Enenkel and Paul J. Smith, eds. (Leiden: Brill, 2017), pp. 91-148; Paul J. Smith, "Joachim Camerarius's Emblem Book on Birds (1596), with an Excursus on America's Great Seal," in *Emblems and the Natural World,* pp. 149-183; Sophia Hendrik, "Ichthyology and Emblematics in Conrad Gesner's *Historia piscium* and Joachim Camerarius the Younger's *Symbola et Emblemata*," in *Emblems and the Natural World,* pp. 184-226.

[130] Ashworth, "Natural History and the Emblematic World View," in *Reappraisals of the Scientific Revolution*, p. 315.

[131] "De crocodile, terrestri simul animali et aquatili, nonnullus iam in II Cent[uria] circa fin dicta sunt," Camerarius, *Symbolorum et Emblematum […] centuria quarta*, f. 66^{v}; For the entries of the crocodile as a quadruped, see Camerarius, *Symbolorum et Emblematum […] centuria altera*, f. 105^{r}-106^{v}.

their problems and frustrations with the existing classificatory schemes for *all* existing animals, not finding emblematic significance for New World ones.

Well before the publication of any of his four volumes of the *Symbolorum et Emblematum*, Camerarius looked to include American plants and animals. Like others who had not traveled to the New World, he needed to gain information from secondhand sources, so Camerarius was keen to collect all he could. In 1585, he wrote to Clusius to inquire about the whereabouts of a manuscript about New World naturalia written by the king of Spain's personal physician.[132] Though his attempts to track down as much information about this little-known region of the world were thorough, he was not able to get a copy of the manuscript, and even Clusius had trouble tracing down the text that would eventually, with the help of the Academy of the Lynx, be published in 1648 as the *Nova plantarum, animalium et mineralium mexicanorum historia* of Francisco Hernández.[133] Still, Camerarius was able to piece together enough information about New World animals, using both travel accounts written by Francisco de Gomara, Jean de Léry, and Peter Martyr, and published natural histories like those of Gonzalo Fernández de Oviedo and Conrad Gesner.

In the armadillo emblem, Camerarius used the animal's hard shell to make a point about virtue being a powerful piece of armor—*virtus lorica fidelis*.[134] Virtue, the epigram

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[132] F.W.T. Hunger, *Charles de l'Ecluse: Nederlandse Kruidkundige, 1526-1609*, vol 2 (The Hauge: Nijhoff, 1927) p. 402.
[133] For long publication history, see Simon Varey, *The Mexican Treasury: The Writings of Dr Francisco Hernández* (Cambridge: Cambridge University Press, 2001); Rafael Chabran, Simon Varey, and Dora B. Weiner, *Searching for the Secrets of Nature: The Life and Works of Dr. Francisco Hernández* (Stanford: Stanford University Press, 2000); David Freedberg, *The Eye of the Lynx: Galileo, His Friends and the Beginnings of Modern Natural History* (Chicago: University of Chicago Press, 2002), pp. 245-274.
[134] Camerarius, *Symbolorum et Emblematum ex animalibus quadrupedibus*, f. 91[r-v].

read, "is firmly sustained by its own weapons," and useful for weathering all sorts of hardships.[135] In order to provide evidence for his allegorical interpretation, Camerarius cited the works of four authors, including Pierre Belon, and came to the conclusion that these animals were "perhaps unknown to the ancients."[136] This did not seem to perturb him, nor did it prevent him from finding allegorical parallels in the literature of ancient authors. Camerarius also owned two armadillos, which he kept in his "treasury of natural things."[137] So, when he looked for an attribute upon which to base his emblem, it was only natural that he chose the trait that had fascinated so many other Europeans. "Just as this rare animal is fortified by natural weapons with which it defends itself and has no need for outside help," he wrote, so too did virtue, like armor, act as a fortification against outside attacks.[138] Camerarius found text in the works of several ancient authors to bolster this association. He cited Claudius Claudianus's *Panegyric on the Consulship of Manlius Theodorus*, who asserted that "virtue is its own reward [… and] no honors raise it higher, nor does it seek glory from the mob's applause."[139] He found a similar sentiment when Horace, in the *Odes*, wrote that "virtue, ignorant of vile defeat, shines with unstained honor, and neither takes up axes nor puts them down at the whims of popular opinion."[140] An updated edition

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[135] "Virtus ipsa suis firmissima nititur armis / saevam hiemem sortis spernere docta malae," Camerarius, *Symbolorum et Emblematum ex animalibus quadrupedibus*, f. 91[v].
[136] "[…] animal quoddam veteribus forsitan incognitum," Camerarius, *Symbolorum et Emblematum ex animalibus quadrupedibus*, f. 91[v].
[137] "[…] binas etiam exuvias […] in nostro rerum naturalium penu habemus," Camerarius, *Symbolorum et Emblematum ex animalibus quadrupedibus*, f. 66[v].
[138] "Quemadmodum itaque hoc rarum animal munitur naturalibus armis, quibus sese defendit, nec externis indigent subsidiis: sic quoque virtus instar loricae in se munita tuta consistit, et insultus adversae fortunae facile superat ac contemnit," Camerarius, *Symbolorum et Emblematum ex animalibus quadrupedibus*, f. 66[v].
[139] Translation from Claudius Claudianus, *Claudian*, vol 1, trans. Maurice Platnauer (Cambridge, MA: Harvard University Press, 1922), p. 339.
[140] "Virtus repulsae nescia sordidae / Intaminatis fulget honoribus,/ Nec sumit aut ponit secures / Arbitrio popularis aurae," quoted in Camerarius, *Symbolorum et Emblematum ex animalibus quadrupedibus*, f. 91[v].

from 1678 added another piece of ancient verse, this time from Menander, who wrote that "virtue is the greatest armor for mortals."[141] The fact that this animal was unknown to the ancients, in other words, did not stop Camerarius from giving it a rich emblematic history, complete with premodern citations.

Emblematic associations were a preoccupation of other naturalists as well, many of whom cited Camerarius well into the end of the seventeenth century. Aldrovandi, following Jean de Léry's description of the armadillo as an "animal that is slow in motion, as a hedgehog walks slowly," wrote that the animal "could be seen as a symbol of discord and sluggishness."[142] But, along with giving his own symbolic interpretation of the animal, he also cited Camerarius's *virtus lorica fidelis*, which was becoming the standard symbolic aphorism for this animal. It is true, as Louise Rice has found, that emblems of New World animals were rare, especially if compared to old world animals for which scholars had centuries to develop associations.[143] Nevertheless, nothing about these animals' newness precluded scholars from forming emblematic associations about them, even in areas outside of the formal emblem book.

Emblem books represented a particular kind of natural history that grounded animals in a literary and allegorical context, but if we turn to other representations of animals in the later seventeenth century, we see much of the same. To return to the poetry that began this chapter, Dr. Powers—after giving what to modern eyes seems to be a

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[141] "Armatura maxima virtus est mortalibus," Joachim Camerarius, *Symbolorum et Emblematum Centuriae Quatuor,* (Mainz: Ludwig Bourgeat, 1678), p. 166.
[142] "Animal hoc in motu lentum […] cum instar herinacei lente gradiatur. Qua de causa pro dissidiae, & socordiae symbol usurpari posset," Aldrovandi, *De quadrupedibus digitatis viviparis libri* p. 479.
[143] Louise Rice, "Villamena's Kangaroo," in *Humanism and Creativity in the Renaissance: Essays in Honor of Ronald G. Witt*, Christopher S. Celenza and Kenneth Gouwens, eds. (Leiden: Brill, 2006), p. 396

remarkably accurate surface description of the animal—used this physical description to ascribe to the animal an emblematic significance. If Powers had consulted any of the many published works about natural history in composing his poems, or even if he had visited a few cabinets of curiosities, he would have seen the struggle that scholars had in placing this animal. He picked up on the difficulties in classification—and the creature's inherent ambiguity—in another of his armadillo poems. "What Indian monster's this that dwells, / under a roof all thatched with shells?," he asked, concluding that "Both Flesh and Fish he is." Playing on its classificatory ambiguity, he described this "sealed tortoise" as sinister precisely because of the duplicity inherent in its liminal status. As environments changed, these animals could opportunistically take advantage of any situation in which they found themselves, since its "Amphibious nature" kept it "secure from Injuryes." This not only had taxonomical implications, but their duplicitousness also shed some light on the human experience. Referring to that "Indian monster," Powers argued that "Thus doe the Parasites at Courte / turn fish or flesh of any sort / & as thinges there doe change their state / do they themselves Transspeciate."[144]

Powers used the ambiguity to create for the armadillo an emblematic significance that drew from the tradition of the medieval bestiary, all the while engaging with questions of classification—animal and human—that concerned scholars of his era. Its slipperiness in classificatory schemes turned into a general symbol of cagey flattery. That symbol was not without precedent. Chameleons, animals that were as rare in Europe in the 1400s as armadillos were in the early 1500s, were, in the medieval bestiary, established symbols of sycophancy because of their perceived ability to change color at will. Taking Pliny's

[144] BL, MS Sloane, 4020, 213^{r}.

description that a chameleon could "constantly change the hue of its eyes and tail and whole body and matc[h] the color with which it is in closest contact," many compilers of medieval bestiaries likened it to Satan, who could appear in different disguises. By the sixteenth century, the chameleon was a generalized symbol of deceitfulness.[145] In Alciato's *Emblemata,* the motto for the chameleon was "Against Flatterers," and in the explanatory verse, he lambasted the animal for being like the "flatterer who feeds on the wind of popular opinion, and devours it all with open mouth," and, even worse, for "imitat[ing] only the malevolent qualities of a prince, knowing nothing of the white or the pure."[146] Even Claude Perrault, who anatomized the animal in 1668 for France's Louis XIV, noted that

> There is hardly a more famous animal than the chameleon. Its admirable properties have always been the subject of natural philosophy and morality. Its ability to change its coloring and the peculiar way in which it nourishes itself which has been attributed to it have provoked much wonder throughout the centuries […] from those who apply themselves to understanding nature. And these marvels which physicians have written about this small animal have made it a most famous symbol used in morality and rhetoric to represent the craven indulgence of courtesans and flatterers, and the vanity that these simple and fatuous minds feed upon.[147]

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[145] Translation from Pliny, *Natural History*: *Books 8-11,* vol. 3, H. Rackham, tr. (Cambridge, MA and London: Harvard University Press, 1983, pp. 87-89. Hope B. Werness, *Encyclopedia of Animal Symbolism in Art* (London: Continuum, 2006), pp. 82-83

[146] "In Adulatores […] adulator populari vescitur aura / hiansque cuncta devorat / Et solum mores imitatur principis atros / Albi & pudici nescius," Alciato, *Emblematum Liber*, f. E4^{r-v}. Both Alciato and Camerarius use the same portion of Horace's *Odes* in their respective emblem descriptions.

[147] "Il n'y a guere d'Animal plus fameux que le Caméleon. Ses admirables proprietez on esté de tout temps le sujet de la Philosophie Naturelle aussi bien que de la Morale: Le changement de couleur, & la maniere particulier de se nourrir qu'on luy atribuë, ont donné dans tous les siecles beaucoup d'admiration […] à ceux qui s'appliquent à la connaissance de la Nature. Et ces merveilles que les Physiciens ont racontées de ce chetif animal, l'ont fait estre le plus celebre symbole dont on se soit servy dans la Morale & dans la Rhetorique, pour representer la lâche complaisance des Courtisans & des flatteurs, & le vanité dont les esprits simples & legers se repaissent," Claude Perrault, *Description Anatomique d'un Cameleon, d'un Castor, d'un Dromadaire, d'un Ours, et d'une Gazelle* (Paris: Frederic Leonard, 1669), p. 3.

Even in the work of a person who, as Peter Sahlins argued, wrote in the "new model of scientific narrative" of the late seventeenth century, the published account of an anatomy of this animal nevertheless included a discussion of its emblematic tradition. In this quintessential model of the new science (as it pertained to natural history, at least), this was still relevant, or at least expected, information.[148]

Thus, in his own attempts to create for the armadillo emblematic connotations, Powers did not represent a throwback from an earlier era, an anachronism clinging to outdated modes of representation. He likely saw the similarities between Pliny's anomalous pig-fish-lizard hybrid (as Pliny described the chameleon), and the pig-fish-lizard hybrid of the American continent, and naturally updated the moral equivalence accordingly.[149] Powers was also not averse to using new tools and techniques to learn more about new world naturalia. Like Perrault's recourse to anatomy to understand the chameleon, in another portion of his New World animal investigations, Powers used the microscope in investigating the "delicate little Bird I have heer seene in England stuffed and dryed brought as it seems from Virginia," which he called the humble-bee bird. He believed it to be "not unlike […] our butterflyes," a claim he made because he had looked at both of their feathers "through a good microscope" and found them to be the same.[150]

Allegorical studies of animals were useful in many ways for medieval Europeans, and this utility did not simply disappear overnight. One of the main uses for animal

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[148] Peter Sahlins, *1668: The Year of the Animal in France* (Cambridge, MA and London: Zone Books, 2017), pp. 280-291. For more on the anatomical tradition, see chapter 5 of this dissertation.

[149] Pliny described the chameleon thusly: "Its shape and size were those of a lizard, were not the legs straight and longer. The flanks are joined on to the belly as in fishes, and the spine projects in a similar manner. It has a snout not unlike a pig's," Pliny, *Natural History*, vol. 3, p. 87

[150] BL, MS Sloane, 4020, f. 217^{v}.

emblems in the medieval bestiary tradition was to illustrate moralistic stories, especially for Christian sermons, and this practice also thrived in the context of the evangelization of Amerindian populations. Sometime in the late sixteenth or early seventeenth century, an unknown author translated forty-seven of Aesop's fables into Nahuatl under the title *In ɉaɉanilli in Eɉopo.*[151] Though no information remains about the translator, or indeed the purpose of these translations, they appear alongside Christian devotional works and linguistic studies of Nahuatl, suggesting that they were made by Franciscans in the Imperial College of Santa Cruz at Tlateloco as part of their project of teaching Latin to Amerindians, translating religious texts into Nahuatl, and recording indigenous knowledge about the natural world.[152] Aesop was a perfect vehicle for all three, providing an elementary Latin text for Aztec students while serving as didactic moral instruction, and allowing the Franciscans to deepen their understanding of Amerindian understanding of the natural world. The start of the translation makes the intent clear: "Here begin the fables set down by the sage Aesop," the text begins, "to teach us how to lead an orderly life."[153]

It would make little sense to the students, however, if these animals were ones which they were unfamiliar. So, the translators did not provide a literal rendition into Nahuatl, but instead intertwined pre-Hispanic conceptions of animals with Christian dogma to make the moral stories more legible to their indigenous audience. As Gordon

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[151] The fables survive in two manuscript copies, one at the Biblioteca Nacional de México, MS 1628 bis, f. 179-191, and the other at Berkley's Bancroft Library, M-M 464, f. 421-426. For a translation of these Nahuatl fables, see Günter Vollmer, Gordon Brotherston, and Gerdt Kutscher, eds., *Aesop in Mexico: Die Fabeln des Aesop in Aztekischer Sprache / A 16th Century Aztec Version of Aesop's Fables* (Berlin: Gebr. Mann, 1987).
[152] Volker, "Provenance of the Texts," in *Aesop in Mexico*, pp. 219-223.
[153] Vollmer, Brotherston, and Kutscher, eds, *Aesop in Mexico*, p. 57. All translations from the Nahuatl by Brotherston and Kutscher.

Brotherson argued, these animals were "naturalized […] not schematically, but according to […] how they become familiar in Mexican eyes," a task made significantly easier since Nahuatl already had a literature "rich in conversation between and with animals."[154] In several of the fables, for example, the Aesopian lion became a jaguar, or the fox became a coyote, because the Aztec symbolic allusions to these animals were similar to those of the original Aesopian intent.[155] In this, there was some precedent. Those who read Bernardino de Sahagún *Historia general de las cosas de la Nueva España* would have learned about Aztec traditions of the "king" ocelot and other indigenous emblems surrounding animals. Some historians have even posited Sahagún as a possible translator of the tales.[156]

In "The Jaguar and the Frog," fable 25 of *In sasanilli in Esopo*, a jaguar became frightened when he heard a loud croaking he assumed came from a large animal. As the jaguar prepared to fight the source of the noise, he saw that it came not from a ferocious beast, but a small frog. Once the frog saw the jaguar, it fled, but the jaguar, ashamed of his cowardice, caught up to it and killed it. The didactic portion of the story followed Aesop's counsel that one should not be needlessly worried about something without understanding it. However, the translators (likely from the input or questions of their indigenous interlocutors) added more context, and "explain[ed] that the jaguar trod on the frog because he was angry and ashamed." In this, the modern translator of the Nahuatl portion argued, "there is here an interest in the jaguar's motives and sensitivity, a feeling one's way into the animals' skin practiced literally by those Aztec knights who dressed for battle as

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[154] Gordon Brotherston, *Book of the Fourth World: Reading the Native Americans Through Their Literature* (Cambridge: Cambridge University Press, 1992), pp. 315-316.
[155] The Jaguar and the Frog (25); The Jaguar, the Ass, and the Coyote (26); The Jaguar and the Wolf (27); The Crocodile and the Coyote (4); The Coyote (6).
[156] Volker, "Provenance of the Texts," pp. 222-223.

jaguars, eagles, or coyotes."[157] The idea of animals as moral storytellers dovetailed with the purpose of the medieval bestiary and provided a link to the emblematic tradition, and attempts like those of this Nahuatl translator, or even Sahagún's meticulous collection of indigenous animal metaphors, show an older tradition thriving not only in a new era, but a new continent.

In the genre of cartography, over the course of the sixteenth and seventeenth centuries, the armadillo acquired a symbology that turned it into first an allegorical representation of all that was exotic and unknown about the New World, and later, into an emblem of the American continent as a whole. Mapmakers were as fascinated by this strange creature as collectors were, and just as armadillos came to settle in the cabinets of learned and wealthy Europeans, so too did they populate European maps. Cartographers had long filled the more unfamiliar regions of the world with exotic or downright fantastical creatures. In a study of sea monsters in medieval maps, Chet van Duzer argued that these creatures served a variety of purposes. Some were added as decorative elements to increase the value of a map, some were meant as warnings against dangers both real and fabricated, and others were manifestations of the idea that nature was playful at the edges of the world. However, a not insignificant number of these animal depictions represented an honest attempt to set down the most up-to-date zoological information of the era.[158] The same was true of maps of the landmass of the American continent. As more and more information reached the ears (and the pens) of cartographers, maps became increasingly

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[157] Brotherson, "Aesop in Aztec," in *Aesop in Mexico*, p. 23. See also Brotherson, *Book of the Fourth World*, p. 316.
[158] Chet Van Duzer, *Sea Monsters on Medieval and Renaissance Maps* (London: British Library, 2013). See also Joseph Nigg, *Sea Monsters: A Voyage Around the World's Most Beguiling Map* (University of Chicago Press, 2014).

zoologically accurate, and zoogeographically correct animals replaced more fanciful monsters in maps.[159] Still, the desire to create visually appealing maps, and to show nature's bounty remained. Mapmakers tended to choose the most spectacular and most reported animals to populate the earliest maps. Thus, the animals that made the first inroads into the interiors of the continent were parrots with jewel-hued wings, opossums with their curious pouches, and our now familiar armored friend.

The earliest surviving European maps depicting Central and South America all depicted the regions' avian life. The Cantino planisphere [**Figure 4.1**] and the world map of Nicolo de Caveri [**Figure 4.7]** both created in 1502, had brightly colored red parrots dominating the region. The 1507 woodcut map made by Waldseemüller (which was based



Figure 4.7: Caverio Map, Bibliothèque Nationale de France, GE SH Arch 1, 1506

[159] For more on zoological cartography, see Wilma George, *Animals and Maps* (Berkeley and Los Angeles: University of California Press, 1969). On mapping and the Spanish empire, see Ricardo Padrón, *The Spacious Word: Cartography, Literature, and Empire in Early Modern Spain* (Chicago and London: University of Chicago Press, 2004).

on the Cantino planisphere from which the author acquired most of his cartographical information) also had one lone parrot decorating an otherwise blank *terra incognita.*[160] **[Figure 4.8]** These three maps were all created by European cartographers working from information brought to them, mainly from Portuguese explorers. It is not a stretch, then, to imagine that these mapmakers also only populated their maps with the animals that they had access to, mainly the parrots that sailors were accustomed to bringing home with them. As news of more American animals made it back to Europe, more images made it into these maps.

In some cases, cartographers depicted unusual animals using the trappings of mythical creatures. Thus, in the 1513 world map by Ottoman admiral Piri Ries, what was likely a tusked peccary turned into a one-horned creature guarding the interior of the

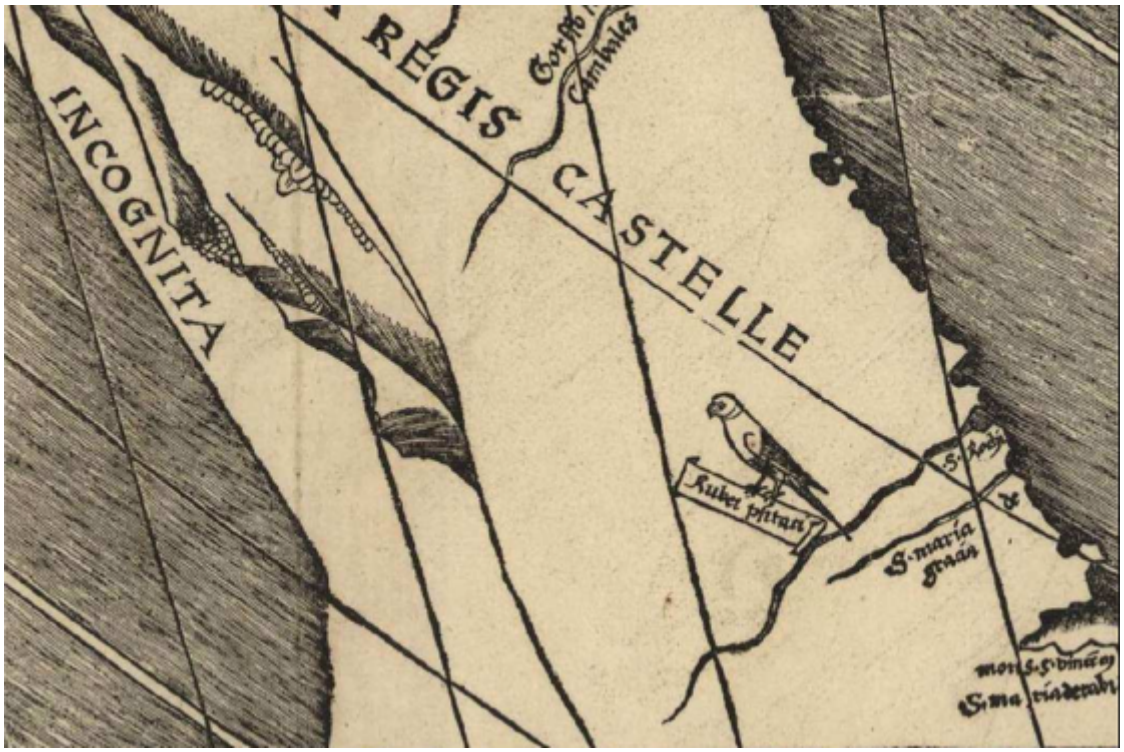

Figure 4.8: Waldseemüller map, 1507

[160] George, *Animals in Maps*, p. 60.

continent, perhaps as a warning to other sailors to stay away, with the reputed fierceness of the unicorn echoing the formidableness of the mountains it guarded.[161] Indeed, as Europeans began to explore what they considered to be the outer reaches of their world, they thought they would surely find the mythical creatures so often depicted in medieval bestiaries, but so seldom seem in Europe. The 1671 *De Nieuwe en Onbekende Weereld*, for example, included an engraving with a unicorn, a moose, beaver, and eagle as part of the native fauna of Canada.[162] **[Figure 4.9]** Neither Montanus nor his engraver, Jacob van Meurs, had traveled to the region, and their choice of animals says more about their



Figure 4.9: *De Nieuwe en Onbekende Weereld*, 1671

[161] Library of Topkapi Palace Museum, Istanbul, No. H 1824.
[162] Arnoldus Montanus, *De Nieuwe en onbekende weereld: of Beschryving van America en 't zuid-land*…, (Amsterdam: Jacob Van Meurs, 1671).

preconceptions than the state of zoological knowledge at the time. Nevertheless, as Wilma George documented, by and large, maps became more representative of zoological knowledge as more information about the New World became more readily available.[163]

In the world map that French cartographer Pierre Desceliers made for Francis I in 1546, the interiors of all of the continents were full of material, and the center of South America was particularly richly populated with both humans and other animals.[164] Much like the actual process of adding geographic landmarks and cities to the edges of landmasses before more was known about the interior, the edges of this map were populated by recognizable animals like armadillos, while the interiors held creatures like dragons and griffins, all in an attempt to fill an otherwise empty space. **[Figures 4.10 and 4.11]** The inclusion of these animals was not merely decorative. As Surekha Davies argued in the context of ethnographic information, Europeans fully expected that the outer reaches of the world would provide a home for humans who both looked and acted



Figure 4.10: Armadillos at the mouth of the Plate River, Descaliers, *Mappemonde*, 1546



Figure 4.11: Dragons in the center of South America, Descaliers, *Mappemonde*, 1546

[163] George, *Animals and Maps,* p. 68.
[164] Pierre Desceliers, *Mappemonde*, John Rylands Library, French Manuscript 1*.

differently from their European counterparts, and the same was true for non-human animals.[165] Desceliers's approach to cartographical zoology was common enough that Jonathan Swift parodied it in *On Poetry: A Rhapsody*. "So Geographers in Afric-maps," he charged, "With Savage-Pictures fill their Gaps; / And o'er uninhabitable Downs/ Place Elephants for want of Towns."[166] Desceliers was one of the many cartographers who did this, thus the interior of that continent on his map was home to two rather large pachyderms. **[Figure 4.12]**

Since the armadillo had such a vast geographic range, with certain species of them stretching as far south as Patagonia and as far north as the Rio Grande, mapmakers



Figure 4.12: Elephants in Africa, Descaliers, *Mappemonde*, 1546

[165] Surekah Davies, *Renaissance Ethnography and the Invention of the Human: New Worlds, Maps, and Monsters* (Cambridge: Cambridge University Press, 2016). For the idea that living things were different in the outer reaches of the world, see also Jorge Cañizares Esguerra, *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World* (Stanford, CA: Stanford University Press, 2006), pp. 64-95; Rebecca Earle, "'If You Eat Their Food …': Diets and Bodies in Early Colonial Spanish America, *The American Historical Review* 115, no. 3 (2010): 688-713. For the idea of the influence of the tropics on the environment, see David Arnold, *The Problem of Nature: Environment, Culture, and European Expansion* (Oxford: Blackwell, 1996).
[166] Jonathan Swift, *On Poetry: A Rhapsody* (Dublin: S. Hyde, 1734).

included them throughout much of the continent, especially where there was little other information they could add to their maps.[167] Armadillos inhabited the South and Central Americas not just of Desceliers's map, but those of many others. Their placement was often vague, and they took the symbolic place of African elephants as zoological placeholders for geographical markers still to be discovered and the cities and towns still to be colonized. They were, in short, a symbol of all that was still mysterious about unexplored lands.

Maps functioned as forms of discourse that communicate certain assumptions about different parts of the world.[168] In the case of the New World, Europeans had expectations about the people (and in some cases, monsters) that populated the continent, and mapmakers both reacted to and helped shape assumptions about these peoples.[169] The same held for cartographic representations of animals, where mapmakers' representations shaped assumptions about the region's fauna, especially about their mysterious nature. However, with the proliferation of colonized cities and towns in these landmasses, cartographic urbanization pushed animals out of the landmasses and into decorative cartouches. Chet van Duzer demonstrated how a similar process occurred with cartographic sea monsters, and how, when more information about marine mammals became available, "the period of the most florid development and widest use of sea monsters on maps had come to an end." These animals lost their status as monsters, and their place in the seas of early modern maps. Their images were relegated to vignettes on

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[167] Stephen R. Humphrey, "Zoogeography of the Nine-Banded Armadillo (*Dasypus novemcinctus*)," in *BioScience* 24 no. 8 (1974): 457-462.
[168] Michael Wintle, "Renaissance Maps and the Construction of the Idea of Europe," in *Journal of Historical Geography* 25, no 2 (1999):137-165.
[169] Surekha Davis, *Renaissance Ethnography*.

the sides of maps, largely replaced in the sea itself by images of ships, and then by smooth, empty stretches of ocean as humans gained confidence in their navigational prowess.[170] A similar development took place in the terrestrial parts of these maps, with humans and other animals leaving the interior of the landmasses, especially in the seventeenth century.

As animals began to move out of the interiors of maps and into their decorated cartouches or ornamental borders, maps and their iconography more blatantly asserted America's savagery and almost unknowable exoticism, while stressing Europe's superiority.[171] This visual argument took the form of allegories of continents, which were rare in the fifteenth century and earlier, but had become common by the late sixteenth century.[172] This personification was a way to deliver a message of European superiority while ascribing (mostly negative) values to other parts of the world. As Michael Wintle argued, Europeans

> attach[ed] certain values to each of the continents by using iconography to visualize virtues as accoutrements to each of the different continents. This type of personification […] was used to establish a hierarchy of the continents, with Europe at the top, Asia in second place, and Africa and America at the bottom.[173]

Although these allegorical representations were created in various contexts, it was in cartography that these emblematic continents most appeared, starting with Abraham

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[170] Chet Van Duzer, *Sea Monsters*, pp. 116-119, quotation from p. 119.
[171] Stephanie Pratt, "From the Margins: The Native American Personage in the Cartouche and Decorative Borders of Maps," *Word and Image* 12, no. 4 (1996), p. 353; Davies, *Renaissance Monsters*, p. 167.
[172] When European cartography consisted of three continents, allegorical representation of the continents was rather rare, and although the three Magi of the Epiphany were sometimes associated with the three known parts of the world, these images were not used as models for later allegorized continents, see Honour, *The New Golden Land,* p. 76.
[173] Michael Wintle, "The Early Modern Iconography of Europe: Visual Images and European Identity," in *Contesting Europe: Comparative Perspectives on Early Modern Discourse on Europe, 1400-1800*, Nicolas Detering, Clementina Marsico, and Isabella Walser-Bürgler, eds. (Leiden and Boston: Brill, 2018), pp. 65-66.

Ortelius's 1570 *Theatrum Orbis Terrarum*.[174] From there, more maps and atlases included these allegorical figures in ornamental boarders, often with emblematic animals in tow. Petrus Plancius's 1594 double hemisphere *Orbis Terrarum* also incorporated allegorical personifications of the regions in the world in each of the four corners of the map, each with her own animal.[175] For the depiction of Mexico, the engraver took the description of a horse and extrapolated it to its most logical conclusion—the figure sits astride her scaled steed, bow and arrow at the ready. **[Figure 4.13]** This was not only a feature of maps—artists of all stripes seized upon the armadillo as the perfect allegory of the New World. As Hugh Honour argued, creating an apt design for the new American continent was a challenge, and artists combined as many of the region's most distinguishing features as possible into a single representative composite.[176] That explains why Mexicana in Plancius's image is not only riding an armadillo—she is also in the foreground of a cannibal's cookout.

In 1594, the Flemish painter Maarten de Vos drew the allegorical series *The Four Continents*. It was later engraved by Adrian Colleart in Antwerp who sold the prints far and wide. [**Figure 4.14]** Here, we again see elements that had by this time become representative of the continent: Amerindians fight Spaniards in the back right of the image; on the left, men prepare human body parts for consumption; and in the foreground,

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[174] For the personification of continents in general, see Wintle, "The Early Modern Iconography of Europe," pp. 65-72; Surekha Davies, *Renaissance Monsters*, pp. 264-268. For the iconography on the Ortelius frontispiece in particular, see Elizabeth McGrath, "Humanism, Allegorical Invention, and the Personification of the Continents," in *Concept, Design, and Execution in Flemish Painting, 1550-1700*, Hans Vlieghe, Arnout Balis and Carl van de Velde, eds. (Turnhout: Brepols, 2000), pp. 43-71.

[175] Plancius's map was the first of many cartographic representations of the world that used the space between the circular hemispheres as decorative spaces, Rodney Shirley, *The Mapping of the World: Early Printed World Maps, 1472–1700* (London: New Holland Publishers, 1993), p. 206.

[176] Honour, *New Golden Land*, pp. 84-117.



Figure 4.13: Petrus Plancius, *Orbis Terrarum*, 1594



Figure 4.14: *America*, Adriaen Collaert, after Maerten de Vos, 1586 - 1591

the now familiar woman and her more familiar steed. This image, first diffused in Colleart's prints, was soon copied by other engravers, and the image of an allegorical America astride an armadillo spread throughout Europe. Perhaps in a nod to zoological accuracy and the knowledge that no one could actually ride an armadillo, Stephano de Bella hitched these animals to a two-wheeled carriage in a 1644 engraving for a set of playing cards presented to the seven-year-old Louis XIV as an allegorical geography lesson. **[Figure 4.15]** De Bella's image conceded that it was clearly a mistake to assume that a person could ride an armadillo—they were far too weak and small for that. Instead,



Figure 4.15: *Amerique,* Stefano della Bella, 1644

for the illustrator who was increasingly familiar with this animal, it made more sense for a trio of them to pull a cart. This choice might seem strange to modern eyes, but at the time, Europeans were used to thinking about animals emblematically, even if they had to bow to realism of sorts. Thus, an allegorical America was drawn by the animals that were emblematic of the region. Designs like these were copied again and again in various media throughout Europe and helped cement this animal in the public's imagination with the American continent.

To turn once again to collectors of naturalia, the German polymath Athanasius Kircher also owned an armadillo, and it was likely this particular armadillo (with the characteristically distorted mouth of a dried specimen) that provided the source for Gian Lorenzo Bernini's Fountain of the Four Rivers (1651).[177] In that fountain, each of the four continents is represented by its major river. Just as it was in Desceliers's 1546 map, the first European map to unambiguously show this animal, Bernini's armadillo is crouched at the foot of the Rio de la Plata, joining the lion (Africa), the sea monster (Asia), and the horse (Europe) as animal representatives of their respective lands. By the mid seventeenth century, when the fountain was built, the armadillo was staunchly representative of the new continent.

[177] Maria Grazia d'Amelio and Tod Allan Marder, "La Fontana dei Quattro Fiumi a Pizza Navona: Iconologia e Construzione," in *"Piazza Navona, ou Place Navone, la plus belle & la plus grande:" Du Stade de Domitien à la Place Moderne, Histoire d'une Evolution Urbaine*, Jean-François Bernard, ed. (Rome: Ecole Française de Rome, 2014), p. 398.

Conclusion: Filling Out the Map of Nature

When Europeans first encountered armadillos, these animals presented themselves bereft of any emblematic trappings. They were, in the early years of conquest, blank slates upon which Europeans projected ideas about the unfamiliar nature of these regions. They often covered maps, their strangeness a synecdoche of all that was unknown about the Americas. In time, however, they gained emblematic associations. They were included in books of emblems, where their sturdy armor became a symbol of virtue. However, this same hard covering led to the armadillo's associations with duplicity since the shell made the animal so difficult to classify. Armadillos also went from being placeholders in the center of maps to symbolizing the continent itself, thanks to a variety of allegorical representations of America that included this curious quadruped. While it was true that New World animals did not have old world signifiers, the tradition of giving animals emblematic associations did not simply disappear with the European conquest. Instead, it was updated for the world's newly discovered animals. However, a central tension was at the heart of these emblematic associations—this animal did not easily fit in the existing European systems of classification.

Europeans simply could not make up their minds about the armadillo. Was it a fish? An amphibian? A quadruped? Like the tricky beast that Powers described, it had a fluid nature, and it was able to move from category to category with ease. The armadillo's resistance to classification drove Europeans' fascination with the animal in the early modern period. Sailors brought them home in droves because of their unusual anatomy, learned men included them in their cabinets of curiosities because of their strange appearance, and artists seized upon them for allegorical representations of the American continent because it existed nowhere else save the New World. The driving force behind

all of this interest was that it did not fit into European classificatory schemes, which had ossified around the animals that were known or imagined in the continent for centuries. Armadillos represented a fundamental problem for Europeans who wanted to make sense of the natural world. By the seventeenth century, armadillos and their American ilk weren't quite the unknowns that they were when Europeans first landed on the American continent, but their identity was not quite yet set. Europeans knew what they were, but not yet where to put them into the ever-expanding book of nature. So, while these animals stopped being anomalies, the questions of classification remained pressing. Animals like armadillos, which remained liminal in the older classification schemes, kept crossing through fundamental categories in a way that revealed the inherent weakness of these systems. Perhaps what was needed, then, was a new system of classification.

CHAPTER 5: A NEW WAY OF LOOKING

Introduction: An Elephant Accidentally Burnt in Dublin

At three in the morning on June 17, 1681, disaster struck Dublin. A blaze broke out on Essex Street in the center of the city. Fire bells pealed and citizens rushed to the site of the commotion. They managed to extinguish the fire but were unable to save the booths belonging to a Mr. Wilkins, purveyor of the strange and the bizarre. One of his largest losses was a touring elephant. It burned alive in its wooden stable, its carcass scorched to black on one side and parboiled on the other. Even dead, it was still in danger. Once the fire was out, the gathered crowd turned its restless energy towards the remains. Paying little heed to the heat rising from what had been Wilkins's main source of income just a few hours before, they began to tear at what was left, eager to take home a piece of an animal that most of them had never seen.[1] Collecting was a hugely popular pastime in seventeenth century Europe, but it was only open to the wealthier orders of society, especially as it related to elephants. The general populace had to pay for only a glimpse of these animals, but that evening, they too could join the collecting classes, if only they could fight their way through the ruckus and grab a bit of the smoldering remains. Elephants

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[1] A[llen] M[oulin], *An Anatomical Account of the Elephant Accidentally Burnt in Dublin, on Fryday, June 17. In the Year 168.* (London, 1682), p. 4. Elephants were not unheard of in Europe, and some European princes had them in menageries in the Middle Ages. Nevertheless, they remained exceedingly rare, even in the early modern period, where technological advances made long-distance shipping of animals more viable, Donald F. Lach, "Asian Elephants in Renaissance Europe," *Journal of Asian History*, 1, no. 2 (1967):133-176. On individual elephants in Europe, see Georg Grüll, "Der erste Elefant in Linz," *Historisches Jahrbuch der Stadt Linz* (1958), pp. 386-390; Silvio A. Bedini, *The Pope's Elephant* (New York: Penguin Books, 2000); Annemarie Jordan-Gschwend, *The Story of Süleyman: Celebrity Elephants and Other Exotica in Renaissance Portugal* (Philadelphia: Pachyderm Production, 2010). On elephants in the British Isles, see Christopher Plumb, "'Strange and Wonderful': Encountering the Elephant in Britain, 1675-1830," *Journal for Eighteenth-Century Studies* 33, no. 4 (2010): 525-543.

were especially rare and expensive in Europe, as one might guess by the mad rush to procure a piece of them once they were dead.

Wilkins, however, wanted to recoup at least some of his losses by exhibiting what he could salvage from his dead prize. He hired armed men to push back the crowd and build a shed around the carcass and he was determined to figure out a way to get his dead elephant to make him money. Wilkins' crew made quick work of the shed, and by the evening, a set of butchers were on hand to dismember the elephant and create a few pieces that he could show to a paying public. Into that commotion of carpenters wielding their hammers, butchers sharpening their knives, and wary soldiers guarding the lot from the crowd entered Allen Moulin. At the time, he was a relatively young medical practitioner, but he was already recognized for his anatomical skill.[2] Suspecting that Wilkins wanted to display the elephant's skeleton—and knowing that skeleton articulation was beyond the skill level of the average butcher—Moulin offered his help in exchange for the rare opportunity to dissect the exotic pachyderm. Moulin intended to do away with the butchers and bring in men of a more philosophical bent as assistants and he also wanted to hire some artists to make images of each step in the segmentation. "But my endeavours," he wrote in a pamphlet describing the incident, "proved fruitless, because about Ten a

[2] Ian Lyle, "Mullin, Allen (1653/4–1690)," *Oxford Dictionary of National Biography* (Oxford University Press, 2004). The *Anatomical Account of an Elephant* was Moulin's first published account of an anatomy, though he referred constantly to earlier unpublished work on humans and other animals (see, for example, Moulin, *Anatomical Account,* pp. 19, 22, 27-30). He would later read papers on animal and comparative anatomy at meetings of the Dublin Philosophical Society, and publish other accounts based on his anatomical work, see Allen Moulin, "A conjecture at the quantity of blood in men, together with an estimate of the celerity of its circulation," *Philosophical Transactions* 16 (1686): 433-434; "An account of an experiment of the injection of Mercury into the Blood, and its ill effects on the lungs," *Philosophical Transactions* 17 (1686): 486-488; "Anatomical Observations in the Heads of Fowl made at several times," *Philosophical Transactions* 17 (1693): 711-716.

Clock that night, when we went to the shed to find what condition the Elephant was in, he emitted very noisome steams."[3] Finishing the dismemberment was now a pressing matter.

Essex Street, where Wilkins kept his menagerie, was prime real estate, and he was afraid that the lord mayor would raise a stink about the stench and order that the carcass be destroyed. Not only would Wilkins lose his chance to recoup his losses, but he was also afraid that he would be punished for leaving rotting remains in the city center for so long. For his part, Moulin also realized that it was not be feasible to postpone the work, although for a different reason. If he waited until morning, he reasoned, he would be able only to "accomplish but a small part of what [he] designed," especially since "it would be both chargeable and difficult to preserve him from the rabble till *Monday* [two days later], and that then the stink would be altogether intolerable."[4] This was, after all, July, and there was a reason why early modern anatomies were done in the winter.[5] To make sure that the authorities would not get involved, that the animal remained intact enough for proper anatomical study, and the smell would be remotely bearable, the dissection commenced by candlelight that very night. By the end of the next day, Moulin had his anatomical observations, and Wilkins had his skeleton. It was not as impressive as a live elephant, but it was something. People paid Wilkins for the privilege of seeing it, and when the novelty of that wore off with the paying public, he sold the whole lot to the highest bidder.[6]

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[3] Moulin, *Anatomical Account*, p. 5.
[4] Moulin, *Anatomical Account*, p. 5.
[5] Giovanna Ferrari, "Public Anatomy Lessons and the Carnival: The Anatomy Theatre of Bologna." *Past & Present* 117, no. 1 (1987), p. 66.
[6] William Petty to Richard Southwell, 4 October 1681, *The Petty-Southwell Correspondence: 1676-1687*, the Marquis of Landsownde, ed. (London, Constable and Co., 1928), p. 96; Moulin, *Anatomical Account*, p. 37.

While this elephant was a rather unusual animal in early modern England, the way that it was treated—described, anatomized, drawn, and a report about it published—became increasingly common as the seventeenth century drew to a close. By the end of that century and into the beginning of the next, general attitudes about how to undertake the study of nature changed. The development and application of experimental methods, as well as new sets of instruments for investigating, representing, and resolving disputes about the natural world helped to usher in a new way of reading the book of nature. It was with a new focus on the dissection of animal bodies that natural history and natural philosophy began to merge, with the traditional interests of the former joining with the newly developing tools and methods of the latter, making way in the eighteenth century for a new study of living organisms.

This chapter argues that the formal goals of newly forming European scientific societies were instrumental in both pushing natural history in a new direction and that the turn towards dissection in these spaces led to the creation of a new set of assumptions and rubrics about how to study animals. This chapter will first contrast two elephant anatomies published by the Royal Society at the end of the seventeenth and beginning of the eighteenth century, and it will use these elephants' second lives as dead objects to illustrate the conjoined worlds of popular entertainment and scientific knowledge. It will also argue for the growing importance of collective research, the centrality of images for conveying information, and the developing notion that instrumental helps were important to the study of nature. It will then turn to an attempt at a large-scale project to produce a comparative anatomy (in the Baconian sense) of the American rattlesnake. The case studies surrounding these two species show the late seventeenth century shift in what naturalists prioritized when creating new works of natural history in the late seventeenth

century, argues that these new methods prioritized internal structures rather than external ones.

Anatomy in the Early Modern Period

Animal anatomies were nothing new in the late seventeenth century.[7] Since the revival of the sustained practice of human anatomy in sixteenth century medical pedagogy, there was—following in Galen's footsteps— a strong emphasis on the utility of animal dissection for learning about the human body, even though early modern readers were often displeased at the slippages that occurred when Galen assumed that human and ape anatomy were homologous.[8] Andreas Vesalius, for example, exhorted medical students to observe dead animals just as much as they observed dead humans and even ended his 1543 *De humani corporis fabrica* with a chapter on how to perform animal vivisection. Just as physicians learned about the number, shapes, and composition of the body's parts from dissection of dead humans, he argued, they could gain information about their functions only by the dissection of live bodies, which for obvious reasons could only be done on animals.[9] He practiced what he preached, and in his own demonstrations, he ended his human dissections with a pig vivisection— a practice that spread to the anatomies

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[7] From the end of the classical period to the middle of the fifteenth century, the very few anatomical accounts that exist highlight the rarity of this line of inquiry. See F.J. Cole, *A History of Comparative Anatomy from Aristotle to the Eighteenth Century* (London: Macmillan, 1944), pp. 48-50.

[8] Sachiko Kusukawa, *Picturing the Book of Nature: Image, Text, and Argument in Sixteenth-Century Human Anatomy and Medical Botany* (Chicago: Chicago University Press, 2011); Andrea Carlino, *Books of the Body: Anatomical Ritual and Renaissance Learning* (Chicago: University of Chicago Press, 1999); Andrew Cunningham, *The Anatomical Renaissance: The Resurrection of the Anatomical Projects of the Ancients* (Brookfield, VT: Ashgate, 1997); Jonathan Sawday, *The Body Emblazoned: Dissection and the Human Body in Renaissance Culture* (London and New York: Routledge, 1995). On the Greek anatomical tradition, see Cole, *History of Comparative Anatomy*, pp. 24-47.

[9] Andreas Vesalius, *De humani corporis fabrica libri septem* (Basel: Johannes Oporinus, 1543), p. 658.

performed elsewhere in Italy.[10] However, Vesalius clearly used these unfortunate animals to understand the inner workings of humans, not to learn about pigs.

It was not just medical texts that compared humans and animals. Pierre Belon's *Histoire de la nature des oyseaux* (1555) included a woodcut of a human and bird skeleton presented side by side. **[Figures 5.1 and 5.2]** The bird's likeness was tortuously contorted to be visually equivalent to that of the human, with the homologous bones marked with

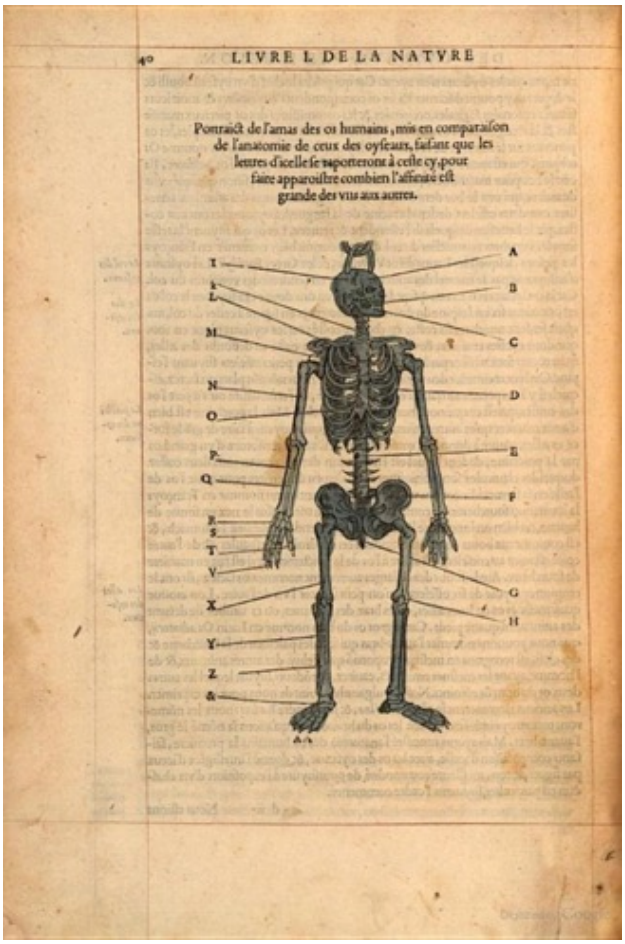

Figure 5.1: Pierre Belon, Portraict des os de l'amas des os humains, *Histoire des Oyseaux*, 1555

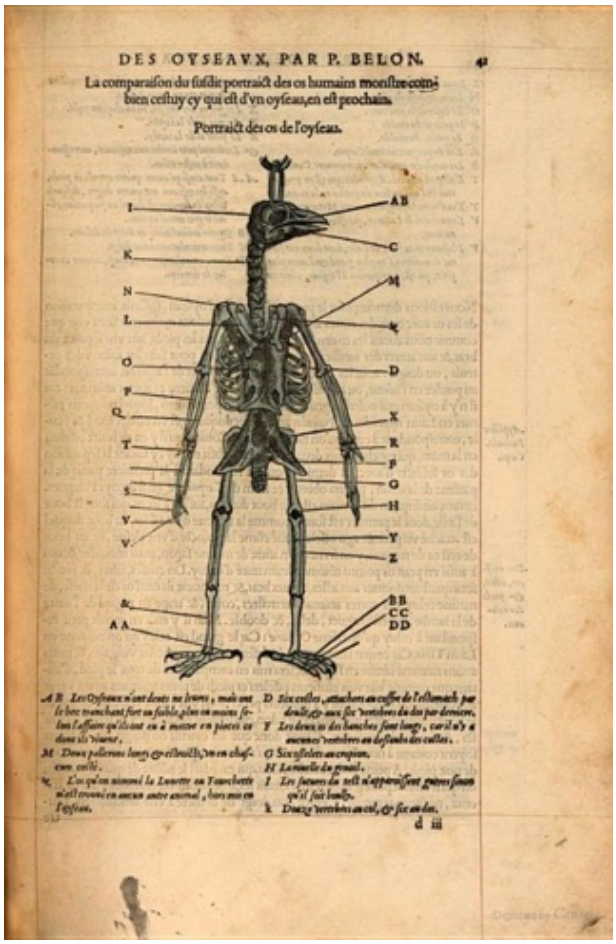

Figure 5.2: Portraict des os de l'oyseau, Pierre Belon, Histoire des Oyseaux, 1555

[10] Vesalius, *Fabrica,* p. 661-663.

corresponding letters.[11] The images were composites created as a result of countless dissections he performed — if we are to believe his account — on 200 different types of birds. He wrote that these dissections allowed him to describe avian osteology in minute detail, but it was clear from his description that he was not interested in learning about these birds as individual species.[12] His boast of hundreds of dissections did not correspond to the same number of descriptions of individual species. Instead, he used them to create an amalgamation that showed the structural unity of all creation by illustrating how birds and humans were nearly identical in their morphology, even if it meant showing the bird in an unnatural state. He also proposed that other animals be compared to the human form in the same way, something he said he would do in his (never published) commentaries on Dioscorides.[13]

Unveiling the interior structures of animals took on a new importance after the publication of the English physician William Harvey's *De motu cordis* (1628).[14] His work, which dealt with the circulation of blood in the body, was built upon the corpses of countless dogs, pigs, and other small animals — 128 different species in total.[15] He believed

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[11] Pierre Belon du Mans, *L'Histoire de la nature des oyseaux* (Paris: Benoist Preuost, 1555), p. 40. Belon studied medicine at the University of Paris, where he would have learned osteology, see Nancy Siraisi, *History, Medicine, and the Traditions of Renaissance Learning* (Ann Arbor: University of Michigan Press, 2008), pp. 227-233.
[12] Belon, *L'Histoire des oyseaux,* p. 38.
[13] The work on Dioscorides was never published, and if Belon had prepared any notes about it, they have not survived, Belon, *L'Histoire des oyseaux,* p. 38.
[14] William Harvey, *Exercitatio anatomica de motu cordis et sanguinis in animalibus* (Frankfurt: William Fitzer, 1628). On Harvey and his later influence, see Theodore M. Brown, "The Mechanical Philosophy and the 'Animal Oeconomy,'" PhD dissertation (Princeton University, 1968); Robert G. Frank, *Harvey and the Oxford Physiologists: A Study of Scientific Ideas* (Berkeley: University of California Press, 1980); Harold J. Cook, "Victories for Empiricism, Failures for Theory: Medicine and Science in the Seventeenth Century," in *The Body as Object and Instrument of Knowledge: Embodied Empiricism in Early Modern Science*, Charles T. Wolfe and Ofer Gal, eds. (Dordrecht: Springer, 2010), pp. 9-32.
[15] F. J. Cole, "Harvey's Animals," *Journal of the History of Medicine and Allied Sciences* 12, no. 2 (1957):106-113 p. 107

(as did other renaissance physicians), that doctors needed to be skilled in the art of anatomy.[16] In discussing the connection between the heart and the lungs, for example, he maintained that if only anatomists "were equally skilled in the dissection of animals as they were in the anatomy of human cadavers, this thing which kept everyone in doubt would, in my opinion, be elucidated without any difficulty."[17] Though some of his contemporaries disparaged his work, his physiological research introduced the problems that would be of major concern to physicians and natural philosophers for the rest of the century and beyond.[18] Moreover, his approach — experimental and animal based — was also adopted by his many intellectual successors.

Animals played a huge role in seventeenth-century physiological experiments.[19] In his work on the transformation of medicine and biology in this period, Mirko Grmek argued that animal experimentation was the single most important characteristic of what he called the first biological revolution.[20] He and others focused almost exclusively on

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[16] On early anatomy more generally, see Andrew Cunningham, *The Anatomical Renaissance: The Resurrection of the Anatomical Projects of the Ancients* (New York: Routledge, 1997); Domenico Bertoloni Meli, "Early Modern Experimentation on Live Animals," *Journal of the History of Biology* 46, no. 2 (2013): 199-226.

[17] "si in dissectione animalium aeque versati essent, ac in humani cadaveris anatome exercitati: Res haec dubio, quae omnes perplexos retinet, palam absque omni difficultate mea sententia elucesceret," Harvey, *De motu cordis,* p. 33.

[18] Geoffrey Gorham, "Mind-Body Dualism and the Harvey-Descartes Controversy," *Journal of the History of Ideas* 55, no. 2 (1994): 211-34; Thomas Fuchs, *The Mechanization of the Heart: Harvey & Descartes*, Marjorie Grene, tr. (Rochester: Rochester University Press, 2001).

[19] See, for example, Peter Sahlins, *1668: The Year of the Animal in France* (New York: Zone Books, 2017); Anita Guerrini, *The Courtiers' Anatomists: Animals and Humans in Louis XIV's Paris* (Chicago: University of Chicago Press, 2015); Andrew Cunningham, *The Anatomist Anatomis'd: An Experimental Discipline in Enlightenment Europe* (Farnham: Ashgate, 2010); Peter Harrison, "Reading Vital Signs: Animals and the Experimental Philosophy," in *Renaissance Beasts: Of Animals, Humans, and Other Wonderful Creatures,* Erica Fudge, ed. (Urbana and Chicago: University of Illinois Press, 2004); Roger French, *Dissection and Vivisection in the European Renaissance* (Ashgate: Aldershot, 1999); Anita Guerrini, "The Ethics of Animal Experimentation in Seventeenth Century England," *Journal of the History of Ideas* 50, no. 3 (1989): 391-407.

[20] Mirko Grmek, *La première révolution biologique: réflexions sur la physiologie et la médecine du XVIIe siècle* (Paris: Payot, 1990), p. 3.

animal dissection and vivisection as it related to human medicine, and quite rightly, since renaissance doctors did rely extensively on animal experimentation to elucidate the workings of the human body. Physicians and philosophers alike pushed for an expanded program of animal anatomy for precisely those ends. The Italian surgeon Marco Aurelio Severino, a contemporary of William Harvey, argued for the importance of what he called zootomy (to contrast with anatomy), and his *Zootomia democritea* (1645) argued for the investigation of the general anatomy of all animals.[21] Nevertheless, he still believed that the true aim of zootomy was to understand the human body.[22] This medical utility also sometimes shielded vivisectionists from criticisms of undue cruelty. In England, Robert Boyle defended his controversial vivisection experiments by arguing "the Naturalist by his Zootomy, may be very serviceable to the Physician in his Anatomical Inquiries."[23] The possible therapeutic ends, in other words, justified the practice.

Though animal dissection was centrally important to medicine, not all animal anatomy was done for purely therapeutic ends. A generation before Boyle, Francis Bacon called for natural philosophers to perform anatomical studies to learn about animals themselves. "In anatomical inquiries," he wrote in *De augmentis scientiarum* (1623), "those things which pertain to man's body in general are most diligently observed," but the knowledge about other bodies fell short.[24] To remedy this, he proposed that scholars do

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[21] Marcus Aurelius Severino, *Zootomia democritaea: id est anatome generalis totius animantium opificii* (Nuremberg: Literis Endterianis, 1645).
[22] Severino, *Zootomia democritaea*, pp. 44 and 49. See also Guerrini, *The Courtiers' Anatomists*, pp. 72-74.
[23] Robert Boyle, *Some considerations touching the usefulnesse of experimental naturall philosophy propos'd in familiar discourses to a friend, by way of invitation to the study of it* (Oxford: Henry Hall, 1664), part 2, p. 21. On Boyle's defense of his vivisection experiments, see Guerrini, "Animal Experimentation," p. 397.
[24] Francis Bacon, *De augmentis scientarum,* in *The Works of Francis Bacon*, vol IV, James Spedding, Robert Leslie Ellis, eds. (London: Longmans, 1875).

what he called "comparative anatomy," which he used not in the modern sense of comparing one species to another, but as the comparison of several anatomies of different examples of one species in order to understand what was essential about that animal. Still, exploring animal anatomy for its own sake was exceedingly rare because for most of the medieval and early modern period, scholars believed that it was exterior forms, not internal structures, that revealed important information about animals.

Instead, the few times anyone performed an animal dissection in the fifteenth and sixteenth century outside of a medical context, it was because of interest in one animal as a singularity. These dissections tended to be of aberrant creatures like two headed calves or conjoined kittens and were part of the culture of scientific spectacle. As Paula Findlen argued, this was especially true in Italy in the mid sixteenth century.[25] There, learned scholars routinely (if still sparingly) dissected abnormally-formed animals in the anatomical theaters that were built alongside museums and botanical gardens— three new sites for the production of knowledge in early modern Europe.[26] New sites also introduced new possibilities for understanding the natural world. Even within the practice of dissecting monsters, the seventeenth century saw a shift towards what Wes Williams called the "internalization of the monstrous," whereby anatomists began to use the internal organs of dissected monsters to determine what caused their abnormal appearance.[27] Rather than dissect an aberrant animal only to reveal its monstrosity, naturalists

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[25] Paula Findlen, *Possessing Nature: Museums, Collecting and Scientific Culture in Early Modern Italy*, (Berkley and Los Angeles: University of California Press, 1994), pp. 209-210.
[26] On the new spaces for the creation of natural knowledge, see Paula Findlen, "Anatomy Theaters, Botanical Gardens, and Natural History Collections," in *Cambridge History of Science: Early Modern Science,* ed. Katherine Part and Lorraine Daston (Cambridge: Cambridge University Press, 2006), pp. 272-289.
[27] Wes Williams, *Monsters and their Meanings in Early Modern Culture: Mighty Magic* (Oxford: Oxford University Press, 2011), p. 201.

increasingly used dissection to understand the causes of outward abnormalities. This was the result of a growing understanding that the locus of important information was revealed only through what could not be seen on the surface. In this new understanding, monsters were strange not because their exteriors differed from the norms, but because malformed interiors led to malformed outer appearances.

With this shift towards internal forms came a greater interest in dissection as a way to study all animals, not just anomalous ones. More and more naturalists began to anatomize animals not because of their medical utility or to highlight their monstrosity, but because the motivation for animal anatomy began to change. Zootomy was no longer a means for a medical end, but an end in and of itself—something worthy of interest, attention, and institutional support. Naturalists realized that cutting open an animal would yield information about it and could in particular help them resolve some of the thornier issues of classification that plagued earlier works of natural history. At the same time, global trade and improvements in the technology of transport made it easier than ever for scholars of the natural world to acquire corpses of even rare and exotic animals. Dissection and comparative anatomy helped create a new conception of natural history that helped solve lingering questions about particular animals and could accommodate animals that did not always fit into older European models.

Elephants in the Royal Society

Most of what we know about the Dublin elephant in the opening anecdote came from Allen Moulin's *An Account of an Elephant Accidentally Burnt in Dublin,* a pamphlet published in 1682. Moulin was an ideal candidate for the dissection not only because he was in the right place at the right time, but because of the confluence of his training and

his interests. At the time of the ill-fated elephant's death, he had just graduated in medicine from Trinity College, Dublin and was working on his doctorate, which he would finish in 1684.[28] The formal undergraduate instruction of Trinity College—as it was in Oxford and Cambridge in the same era—was broadly conservative and scholastic in its outlook, though there were resources for enterprising students like Moulin to engage with modern writers and learn about new developments in natural philosophy in England and on the continent.[29] Moulin's pamphlet was his attempt to join the ranks of these new philosophers, or at least to catch the eye of some of them.

The pamphlet began as a letter written to William Petty, a leading figure in several English philosophical circles, including the Royal Society.[30] Despite his later prominence as an economist, Petty studied medicine at Oxford and had a connection to anatomy from his time as the deputy anatomist to Thomas Clayton, Regius Professor of Medicine. Clayton was less known for his medical skill than for his medical incompetence and squeamishness in matters of gross anatomy, so it is likely that Petty (not Clayton) actually performed the thrice-yearly human dissections for the benefit of Oxford's medical students until 1652 when Petty left for Ireland.[31] By 1681, Petty had drifted far from his early training, and when Moulin wrote to him, he was most well known in Ireland as a political

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[28] Lyle, "Mullin, Allen," *ODNB*.
[29] Early catalogs of books in the library, for example, show that in the seventeenth century, the college acquired books by Agricola, Aldrovandi, Bacon, Copernicus, Gesner, Kepler, Rondelet, and others, see K. Theodore Hoppen, *The Common Scientist in the Seventeenth Century: A Study of the Dublin Philosophical Society, 1683-1708* (London and New York: Routledge, 2009), pp. 59-60. For a more general account of Trinity College in this period, see chapter 3 of the same work, as well as Hugh Kearney, *Scholars and Gentlemen: Universities and Society in Pre-Industrial Britain, 1500-1700* (Ithaca: Cornell University Press, 1970), pp. 152-153.
[30] Ted McCormick, *William Petty and the Ambitions of Political Arithmetic* (Oxford: Oxford University Press, 2009).
[31] Robert Theodore Gunther, *Early Science in Oxford, Vol. 3: Biological Sciences, Biological Collections* (London: Dawsons of Pall Mall, 1967), pp. 88-90; For Petty's time as an anatomist, see Bodleian Library, MS Tanner 302, f. 273^{r}.

economist. Nevertheless, his early training, coupled with his geographical location and his connection to the Royal Society, made him a natural choice for the younger doctor to correspond with.

Moulin was ready to make a name for himself in this glitteringly new scientific society, and he saw in this half-burnt elephant a way to get his foot in the door. His letter was favorably received and was published under the aegis of the Royal Society alongside another of his anatomical works, *A Relation of New Anatomical Observations in the Eyes of Animals.* With these two publications, Moulin's position in the Royal Society was secured. He traveled to England that year to see the work through the press, where, armed with a letter of introduction from the archbishop of Dublin praising him for his success "in several things that he has undertaken, especially in anatomy, wherein he has good skill," he first met Robert Boyle, who would later recommend him to become a member of the Royal Society.[32]

In many respects, Moulin's 1682 publication was groundbreaking. It represented the most reliable information available about elephants for the European reading public up to that point. Not long after the work was printed, it was summarized in the *Acta Eruditorum,* and knowledge of Moulin's elephant spread to all corners of the learned world. In Hiob Ludolf's *Historia Aetheopiae* (1691), for example, references to Moulin's dissection coexisted peacefully with citations from the Bible that suggest the possibility that the behemoth referenced in the Old Testament was an elephant.[33] However, many of these sources

[32] Narcissus Marsh to Robert Boyle, 23 June 1682, in K. Theodore Hoppen, ed., *Papers of the Dublin Philosophical Society 1683-1709* (Dublin: Irish Manuscripts Commission, 2008).
[33] A review of it, as well as Moulin's other publication on the anatomy of animal eyes, was translated into Latin and published in December 1684, "Historia anatomica Elephantis Dublini casu incendio perempti, una cum relatione novarum quarundam observationium anatomicarum

recognized that despite its breadth of elephantine information, Moulin's work was somewhat deficient. The nature of the animal's death made it impossible for him to physically see some of its internal anatomy, but more pressingly, as standards of anatomical practice became codified in the 1690s, Moulin's text no longer fit so well with the established model of animal dissection. This became a central concern the next time a touring elephant died near someone interested and skilled in anatomy.

In May 1706, the Scottish surgeon Patrick Blair wrote to Hans Sloane, then secretary of the Royal Society and clearinghouse of information on all manner of natural oddities. After thanking Sloane for his previous support and patronage, Blair asked him for some advice. A female elephant had died about a mile from Dundee. He dissected it and wanted to publish his account of it.[34] Sloane was enthusiastic and sent, along with his reply, the only other modern articles about the anatomy and osteology of this animal with which he was familiar.[35] The first was Wilhelm Ernst Tentzel's *Epistola de sceleto Elephantino* (1696), a description of some bones found in Thüringen that the author believed belonged to an elephant that had died at the time of the Biblical flood.[36] This publication embroiled him in a controversy over whether or not the animal was an elephant at all. Gottfried Leibniz opposed Tentzel's interpretation, arguing instead that the bones belonged to a large elephantine marine creature that no longer lived in the area. The latter vehemently disagreed, and though both agreed that the bones were the remains of a once living animal

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in animalium oculis," in *Acta Eruditorum,* 12 (1684): 581-585; Hiob Ludolf, *Historiam Aetheopica antehac editam commentatius* (Frankfurt am Main: J. D. Zunneri, 1691), p. 148.

[34] British Library (BL), MS Sloane 4040, pp. 169-170.

[35] Patrick Blair, *Ostographia Elephantina. Or, a Description of the Bones of an Elephant, which Died Near Dundee, April the 27th, 1706* (London: G. Strahan, 1713), p. 2; BL MS Sloane, 4040, pp. 169-170 and 174.

[36] Wilhelm Ernst Tentzel, *Epistola de sceleto Elephantino Tonnae nuper effosso…* (Jena, 1696).

and not a *lusus naturae*, they could reach a compromise on little else.[37] Tentzel eventually sent his paper to the Royal Society along with some fragments of teeth and bone with the hope that its members would vindicate his opinion over Leibniz's. The Royal Society received his gift and publicly thanked him in the pages of the *Philosophical Transactions* but made no mention of the philosophical controversy.[38] He wanted the Royal Society to come out in support of his interpretation and, frustrated by their silence, he wrote John Ray as late as 1710, asking him what the society's position on these bones was.[39] Seeing in Blair's work the possibility of a solution to this question, which was also a matter of some contention among the members of the Oxford Philosophical Society, Sloane encouraged Blair to write up his observations, especially an osteological account, in hopes that he could weigh in on the elephant-related controversy on the continent.

Along with Tenzel's publication, Sloane also sent a copy of Moulin's account of the Dublin anatomy, which was the only complete anatomical account of an elephant available at the time. Since Blair had not examined the elephant's bones, he had little to add to the osteology debate, but he certainly had a bone to pick with Moulin. He wrote that the latter's account was highly unsatisfactory, even as he admitted that Moulin's overall conclusions were generally sound. As a result, when Blair wrote up his experience for

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[37] The debate between the two plays out in the correspondence between Leibniz and Tentzel from May to November of 1696. Leibniz believed that the bones belonged to a marine animal not then currently known to scholars, Leibniz to Tentzel, 10(20) July 1696. He also conceded that in the past, there could have been types of elephants that were more adapted to colder climates. Nevertheless, Leibniz argued that it categorically could not be called a modern elephant, Leibniz to Tentzel 17(27) June 1696. All letters translated by Lloyd Strickland and reproduced in http://www.leibniz-translations.com/tentzel.htm.

[38] Wilhelm Ernst Tentzel, "Epistola de sceleto elephantino tonnae nuper effosso," *Philosophical Transactions*, no. 234 (1697): 757-776.

[39] BL, MS Sloane, 4037, p. 316. A related controversy about large bones being those of giants or animals was also taking place among Royal Society's members. For the debate of fossil bones in early modern Europe, see Rhoda Rappaport, *When Geologists Were Historians, 1665-1750* (Ithaca: Cornell University Press, 1997), especially pp. 112-119.

Sloane, he consciously structured it to fill the informational gaps that Moulin left behind. This proved difficult, however, because Blair's elephant died in near as gruesome a way as Moulin's.

If Moulin's elephant was accidentally burnt in Dublin, Blair's accidentally drowned in Dundee. The elephant the latter dissected traveled through most of Europe before reaching Edinburgh, where it remained for some time while the citizenry paid their shillings to see it. From there, its owners sailed to the north of Scotland and made their way back down south along the eastern coast, but since there were few cities large enough to profitably exhibit the elephant, it was forced to walk long distances without much rest. Fatigue and hard roadways finally got the best of it, and a mile from Dundee, it collapsed. Nothing would compel it to get up again, so its owners dug her into a ditch so it could lean on the walls until it regained her strength. This proved disastrous when it began to rain and the ditch began to fill with water. Too weak to climb out of the hole and too large to be hoisted out, the elephant drowned.[40] Blair only reached the carcass a month later, and by then, the animal was already partially dissected. Blair finished the job and presented a proposal to Sloane in late 1706 or early 1707 to formally write up his findings.[41] The work was printed in two issues of the *Philosophical Transactions* in 1710 and re-issued as a stand-alone pamphlet in 1713.[42]

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[40] Blair, *Ostographia Elephantina*, p. 3
[41] Patrick Blair, "Proposals for a new book to be printed entitled *Ostographia Elephantina*," BL MS Sloane 4020, p. 211.
[42] Patrick Blair, "Ostographia Elephantina, Or, a Description of the Bones of an Elephant, which Died Near Dundee, April the 27th, 1706," *Philosophical Transactions* no. 326 (1710): 53-116, continued in no. 327, (1710): 117-168.

Spectacular Cadavers

Both Moulin and Blair owed a great deal to itinerant showmen. Before either anatomist met their respective elephants, the history of these elephants would not have been about anatomy, natural history, or anything even bordering on the philosophical. It would not even have been a story about advances in learned collecting or the delicate links of the Republic of Letters, where rare, exotic, or beautiful things were traded not for cash, but for favors, credit, or other beautiful things. Before the elephants died, the narrative would have been about two people who wanted to make their fortune by exhibiting one of the rarest creatures to be seen in the British Isles, an Asian elephant.

Live elephants were expensive and difficult to bring to Europe from Asia and Africa, and even harder to keep alive once they arrived.[43] For example, when king Manuel I of Portugal wanted to dazzle pope Leo X in 1514, he sent a huge contingent of rare animals, but the undisputed prize of that collection was a white elephant.[44] The costs of transporting elephants were staggering, and so were their upkeep. Even small elephants ate an astounding amount of food.[45] During the rest of the sixteenth century, only a handful of elephants made their way to Europe, all of them brought via Portugal.[46] Elephants were slightly more common in Europe in the seventeenth century. Sketches and engravings survive from several elephants that toured throughout the continent, including the female elephant Hansken, who was brought to Amsterdam in 1630 and displayed in

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[43] Donald F. Lach, "Asian Elephants in Renaissance Europe," *Journal of Asian History* 1, no. 2 (1967):133-176

[44] Silvio A. Bedini, *The Pope's Elephant* (New York: Penguin Books, 2000); Lach, "Asian Elephants in Europe," pp. 148-153.[45] Dispatch from the treasurer to the king, 20 December 1510, quoted in Bedini, *The Pope's Elephant,* p. 32.

[45] Dispatch from the treasurer to the king, 20 December 1510, quoted in Bedini, *The Pope's Elephant,* p. 32.

[46] Lach, "Asian Elephants in Europe," p. 134.

fairs in the Netherlands, Germany and Italy until her death in 1655 in Florence.[47] Louis XIV received the gift of an African elephant in 1668, and the anatomist Marcello Malpighi wrote a description of the one he had seen in Rome.[48] Both Moulin and Blair's elephants toured extensively in the British Isles. Blair's elephant entered England in 1675 where he was exhibited at Garraway's Coffee House in London.[49] He was brought to Oxford the following year where Robert Plot compared his teeth to some fossilized samples kept in the Ashmolean.[50] Finally, the elephant was sent to Ireland before landing in Scotland.[51] Despite this relative increase in frequency of elephant visitors, time did not make the transport of these animals much easier. Almost a century after Blair's elephant died, an English showman advertised his elephant by claiming that it was "the only animal of its kind seen in this kingdom for upwards of twenty years."[52]

Though still rare, by the late seventeenth century these animals were not quite extraordinary enough to be suitably grand gifts for monarchs. Moreover, the enormous cost for upkeep made them impractical for many menageries. Instead, the elephant of the

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[47] Leonard J. Slatkes, "Rembrandt's Elephant," *Simiolus* 11, no. 1 (1980), p. 8; Lach, "Asian Elephants in Europe," p. 176; Michiel Roscam Abbing, *Rembrandt's Elephant: The Story of Hansken* (Amsterdam: Leporello Uitgevers, 2006).
[48] Lach, "Asian Elephants in Europe," p. 176, n. 165.
[49] On the entry of the elephant into England, Christopher Plumb, "Exotic Animals in Eighteenth Century Britain," PhD dissertation (University of Manchester, 2010), p. 200. Garraway's Coffee House was a popular destination for exotic animals—Edward Tyson dissected a porpoise there in 1680, see Markman Ellis, *The Coffee House: A Cultural History* (London: Weidenfeld & Nicolson, 2004), p. 121.
[50] Plot compared them to a set of giant teeth in the collection of the anatomy school at Oxford (now identified as those of a mammoth). He concluded, based on this bit of comparative anatomy that the teeth belonged to those of a giant, since they were so much larger than the teeth of the largest mammal Plot had ever seen, Robert Theodore Gunther, *Early Science in Oxford: Vol.* 3 (Oxford: Oxford University Press, 1925), p. 256.
[51] Moulin's elephant had also been in Scotland sometime before it died, and there were several people near Dundee that had gone to see both elephants, see Blair, *Ostographia Elephantina,* p. 49.
[52] Quoted in Kurt Koenigsberger, *The Novel and the Menagerie: Totality, Englishness, and Empire* (Columbus: Ohio State University Press, 2007), p. 50.

seventeenth century was more commonly a traveling one, exhibited for and maintained by ticket sales. In his article on Asian elephants in Renaissance art, Donald Latch argued that "everywhere they went, elephants […] stimulated the curiosity of artist, scientist, humanist, and man on the street."[53] There were no shortages of willing spectators, and showmen could, if not make their fortune, at least make a living by exhibiting an elephant if they had the capital and connections necessary to bring one over to Europe.

Moulin and Blair did not entirely inhabit this world of commercial exhibition. Like many (but not all) authors who aspired to publish in the *Philosophical Transactions*, they existed in a sphere where scientific discussion was done in polite society.[54] However, the circumstances that led them to their respective elephant carcasses placed them firmly in the world of commercial spectacle. As a result, they were dependent on the demands of the elephant's impresario. This was especially true of Moulin, who had to navigate competing interests in order to come to a workable solution that gave the elephant's owner everything he wanted, but still allowed Moulin to use the elephant for his own ends as well. Little is known about Wilkins, the owner of the Dublin elephant, but he probably led a peripatetic life managing a traveling collection of curiosities. Though he certainly laid out a substantial initial sum to either arrange for an elephant to be brought from Asia or to purchase it from a trader, he was nevertheless not a wealthy man, and the loss of his

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[53] Lach, "Asian Elephants in Europe," p. 134.
[54] Jan Golinski, *Science As Public Culture: Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge: Cambridge University Press, 1992); Geoffrey Sutton, *Science for a Polite Society: Gender, Culture, and the Demonstration of Enlightenment* (New York: Westview Press, 1995). On gentlemanly science in early modern England, see Steven Shapin, *A Social History of Truth, Civility and Science in Seventeenth-Century England* (Chicago: University of Chicago Press, 1994) and Steven Shapin and Simon Schaffer, *Leviathan and the Air Pump: Hobbes, Boyle and the Experimental Life* (Princeton: Princeton University Press, 1985).

elephant dealt him a severe economic blow.[55] Elephants were expensive, difficult to transport, and even harder to keep alive. At the same time, however, owners could charge a great deal for admission. Exotic animal shows were popular for the same reason that printed works of natural history were popular: the public was interested in unusual things. Traveling exhibitions were one way of satisfying that curiosity.

Wilkins was not interested in the scientific side of natural history, and he certainly had no abiding concern for anatomy. He was content to simply hire the nearby butchers to dismember his elephant and call it a day. In his pamphlet, Moulin disparaged these butchers' ineptitude, and he "endeavor[ed] to persuade [Wilkins] to discharge some Butchers which he had in readiness to order the elephant after their way, and to leave the whole management to me, and to such as I thought fit to employ."[56] His reluctance to use these butchers was a result of the different aims and motivations for dismemberment that the two people had. In the end, because of the pressing need to get the elephant carcass cleaned up, Moulin was forced to use the people whom Wilkins had already hired, though he complained bitterly about it. Throughout the work, he lamented that there were several finer points of anatomy he was unable to settle because Wilkins's men, in their "forwardness to cut and slash what came first in their way, and their unruliness withall," made so many cuts that the original structure was in some places unrecognizable.

Moulin was, for example, unable to give a satisfactory account of the elephant's reproductive system because the butchers had done a hatchet job—quite literally—on the area. Where Moulin expected to find testicles, he instead found

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[55] William Petty to Richard Southwell, 4 October 1681, *The Petty-Southwell Correspondence,* p. 96
[56] Moulin, *Anatomical Account*, p. 25.

> a substance the shape of a Pear […]. I did what I could by different ways of dissection to find out what manner of thing this was, which was altogether strange […] but after all can give but a very imperfect account of it.[57]

The reason for his ignorance, he regretfully told his readers, was these "unruly" butchers who had cut up the animal without care to the damage it would do for understanding its interior structure.[58] Though he had observed "Spermatick Vessels" in this pear-shaped organ and was convinced that it had a role in the production of semen, the vas deferens had "unadvisedly" been cut, so Moulin found it impossible to tell for sure. The problematic cuts, however, were only partially caused by the butchers' lack of skill or care—they were also the result of Wilkins' instructions, which trumped Moulin's.

Wilkins and Moulin had different aims, and this directly impacted Moulin's ability to understand the elephant's reproductive system. The former wanted a to keep the penis intact to display it—as a result, severing the vas deferens was unavoidable even if it meant that Moulin's questions about elephant reproduction remained unanswered. These different agendas came to the fore in Moulin's attempt to examine the muscles and fibers on the elephant's proboscis to try to understand how something with no bones could move. The matter, he wrote, would have been cleared up with a more minute examination of the muscle fibers, an examination he was unable to do because he was "hindered by the manager to search for them, least I should make it unfit for preservation."[59] In the end, it was Wilkins's will that carried the day. It was, after all, his elephant. Educated anatomist or not, Moulin could perform his work only insofar as it did not interfere with Wilkins's need to have something spectacular to display and recoup his losses.

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[57] Moulin, *Anatomical Account,* p. 25.
[58] Moulin, *Anatomical Account*, p. 25.
[59] Moulin, *Anatomical Account*, pp. 32-33.

We know that Wilkins managed to successfully exhibit the elephant's skeleton and various remaining bits from a letter that William Petty wrote to Robert Southwell. The latter heard about the fire in the city and wanted to know how the elephant had fared. Petty, like many residents of Dublin, had gone to see the elephant both before and after its death, and reported to Southwell that "it is become a publick shew of the Painted picture, the Sceleton, the Trunk, Tong, Gutts, Penis, Bladder and some parts of the Skin."[60] Given this list, it was no small wonder that Moulin had trouble with the anatomy. The butchers may have made a complete anatomy impossible, but they were only following the orders of their employer who saw this animal as, first and foremost, a commercial endeavor. And Wilkins did rather well in it, according to Petty. "They get sometimes 20 shillings a day," he wrote, "and neither doth the Skeleton eat any oats."[61]

Blair's elephant also belonged to someone who wanted to make money from it, and thus he was plagued with similar problems. When that elephant died, its keepers were hauled up before the local magistrates. After "having made an Oath that they had done her no designed injury," they quickly sold the elephant to the highest bidder—the town provost, George Yeman—and beat a hasty retreat.[62] Like Wilkins, Yeman quickly assembled guards to protect the carcass from the crowd, though he was unable to stop some intrepid souvenir hunter who managed to carry off its left foreleg.[63] He then, according to Blair, ordered that "the skin be flea'd off, which was his chief design, and the

[60] Petty to Southwell, Dublin, 24 September 1681, *The Petty-Southwell Correspondence 1676-1687*, p. 95.
[61] Petty to Southwell, *Petty-Southwell Correspondence,* no. 51.
[62] Blair, *Ostographia Elephantina*, p. 3.
[63] Luckily for the provost, and unluckily for the thief, "after much pains and earnest care," he was able to recover it six weeks later, Blair, *Ostographia Elephantina,* p. 4.

Body be opened, which was mine."[64] Taxidermy was a relatively new technique in the early eighteenth century, and although much early work created animals that bore little resemblance to their original states, they were a huge draw for spectators.[65]

Preparing a perfect skin came at the cost of breaking bones and cutting through muscle, however. Blair recounted with irritation that most of the daylight was spent painstakingly flaying the elephant so the provost could take home an unblemished skin, leaving the anatomist a paltry hour of sunlight to make his own observations. Also, although he had better luck with his butchers than Moulin did, they still did not look at the animal with the eyes of philosophers. He directed their efforts as best he could, and he had the ultimate say in what was or was not to be cut, but that did not stop the "unwieldy hands of unruly butchers" from cutting structures he wanted to examine more closely. In the end, he wrote they were "useless, cutting and tearing wheresoever they came."[66] But just as in as in Moulin's case, cutting up the elephant did not compromise the real purpose of the project, since, as Blair wrote in his pamphlet, the stuffed animal was "done to so solid purpose and so lively that it is become a most curious Ornament" in the Dundee Hall of Rarities.[67]

This does not suggest that either Moulin or Blair were averse to doing anatomical work themselves and getting their own hands dirty. Like others in their cultural milieu, they were convinced that knowledge came from doing. Moulin had trained as a physician

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[64] Blair, *Ostographia Elephantina*, p. 4.
[65] On early taxidermy, see Paul Lawrence Farber, "The Development of Taxidermy and the History of Ornithology," *Isis* 68, no. 4 (1977): 550-566; on taxidermy as spectacle, see Rachel Poliquin, *The Breathless Zoo: Taxidermy and the Cultures of Longing* (University Park, Pennsylvania: University of Pennsylvania Press, 1992), pp. 77-110.
[66] Blair, *Ostographia Elephantina*, pp. 4-5.
[67] Blair, *Ostographia Elephantina*, p. 18.

and Blair as a surgeon, and both had undertaken extensive anatomical work—both human and animal. They also both had similar sensibilities about the haptic nature of knowledge-creation. As Pamela Smith argued, by the seventeenth century, "the pursuit of natural knowledge became active and began to involve the body; that is, one had to observe, record, and engage bodily with nature."[68] For Moulin and Blair, physically immersing themselves in the work of anatomy was the best way to understand the animals they encountered. Both of these people did the detailed anatomical work themselves insofar as it did not interfere with the respective owners' wishes. The professional butchers were on hand only because Wilkins and Yeman hired them, but their job was to create something that was very much *not* a work of anatomy. That Moulin and Blair were willing to wade into a putrefying mass of dead elephant and deal with what the butchers left behind is a testament to how important anatomy had become to the study of natural history, especially as it was being practiced in the scientific societies of the era.

A New Way of Looking: Collective Research, Images, and Instruments

The way that both Moulin and Blair dissected their elephants illustrates a shift in how natural history was practiced in the latter part of the seventeenth and into the eighteenth century. For one, the practice became collaborative in a different way than it had previously been. The world of Renaissance natural history was, of course, a collective one, and naturalists saw themselves, as Brian Ogilvie has argued, very much as one node connected to the broader Republic of Letters.[69] However, as Lorraine Daston has pointed

[68] Pamela Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago: University of Chicago Press, 2004), p. 18.
[69] Brian Ogilvie, *The Science of Describing: Natural History in Renaissance Europe* (Chicago: University of Chicago Press, 2006), chapter 2.

out, the ideal of the Republic of Letters was ever only an imperfectly described reality, and its citizens could never be disjointed from their religious, familial, or economic realities.[70] The world of eighteenth-century anatomy required the cooperation of people from across the social and economic spectrum. In the case of these two elephants, the physical act of dissection was predicated on the permission of the owner of the elephant body. Its dissection not only created an open body, but it also fragmented the animal, creating new objects that moved through a variety of private spaces.[71] For example, while Moulin preserved most of the organs and the skeleton so he could examine them at his leisure later, he could not keep them—they went to Wilkins. While Wilkins was happy to let Moulin consult the items while they were in his possession, once he sold his collection, access became a problem.[72]

Gaining access was such an issue that Moulin had to rely on the Royal Society's influence to get things done. When it became clear that they would publish the pamphlet, he advised Petty that "[t]he Skeleton is better express'd by a Plate well Engrav'd. […] I desire you would imploy one to take an Icon of it; you may find it with Mr. Dockwra Merchant in Lime Street."[73] As Deborah Harkness argued, the hub of study in natural history in early modern London was the parish of St. Dionysus Backchurch, along the short and winding Lime Street. There, naturalists, merchants, and other interested parties

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[70] Lorraine Daston, "The Ideal and Reality of the Republic of Letters in the Enlightenment," *Science in Context* 4, no. 2 (1991): 367-386.
[71] On the practice of purchasing pieces of animals in the commercial sphere, see Plumb, "Exotic Animals in Eighteenth Century Britain," p. 201.
[72] Moulin, *Anatomical Account*, p. 41. Immediately before this purchase, Dockwra made a small fortune through the creation of the London penny post. The elephant may have been a way for him show off his wealth, Thomas Todd, *William Dockwra and the Rest of the Undertakers: The Story of the London Penny Post, 1680-1682* (Edinburgh: C.J. Cousland, 1952).
[73] Moulin, *Anatomical Account,* pp. 38-39.

created a network of collaborating experts who promoted the exchange of information.[74] Dockwra was likely not an amateur naturalist and neither had he added the elephant to his collection for the purpose of his own scholarship. Nevertheless, he was interested in being part of the milieu from which naturalists and natural philosophers might request information or access to specimens. As a result, Moulin's work was the product of a concerted effort by a young physician interested in new ways of describing animals, a wealthy merchant interested in natural history, engravers working for the Royal Society, and the Society itself, who contrived to have this pamphlet published in the first place. Though naturalists of an earlier generation also relied on networks of exchange and the skill of trusted artisans, by the end of the seventeenth century, the act of writing a work of natural history became a much wider-ranging collaborative effort.

Not only was the process of gathering material more collaborative, the information that naturalists like Moulin and Blair conveyed also changed. Unlike earlier authors, their accounts did not begin with a painstaking recording of what other authorities wrote. It was not that citation and commentary were absent in their works, but both anatomists felt that the older works about the elephant by and large dealt with superficial particularities. Anatomy, on the other hand, provided a window into the essences and natures of things. In Moulin's preface, for example, he wrote that he would not trouble the reader, "with a Repetition of what has been said of the elephant by Pliny, Gesner, and others, being very little, if any way, instructive to anyone."[75] Instead, he looked to modern anatomists like Galen, Marcello Malpighi, and Nicolaus Steno to see where his anatomical account

[74] Deborah Harkness, *The Jewel House: Elizabethan London and the Scientific Revolution* (Yale University Press, 2007), pp. 15-56
[75] Moulin, *Anatomical Account,* p. 6.

corroborated or conflicted with theirs. In the case of the spleen, for example, rather than describe it in any detail, Moulin noted that what he saw was similar to what Malpighi described in *De viscerum structura* (1669).[76] Since his account coincided with what another anatomist found in his dissection, Moulin felt that there was "nothing else in it that deserv'd particular notice to be taken of it."[77] Though Malpighi did not dissect an elephant spleen, what Moulin found coincided with the former's account of a typical spleen, and Moulin left the reader secure in the knowledge that elephant spleens had nothing distinctive about them. However, since elephants were elusive commodities, Moulin could not personally compare elephants to elephants for a complete comparative anatomy in the Baconian sense.

In this regard, Blair was more fortunate. When he told Sloane that he could provide the Royal Society with an anatomical account of an elephant, Sloane immediately gave him Tentzel's and Moulin's texts with the hopes that he could fill in the gaps those accounts had left. Blair could not only describe, but also compare in the way Bacon had urged. Reading these texts in conjunction with his own dissection notes, for example, allowed him to realize that the image of the skeleton published in Moulin's pamphlet was poorly drawn. As a result, Blair made sure to have his image "truly drawn and exactly cut" and to have it done locally so that he could correct every step of the process.[78]

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[76] Marcello Malpighi, *De viscerum structura exercitatio anatomica* (Bologna: Giacomo Monti, 1666), pp. 101-150.
[77] Moulin, *Anatomical Account,* p. 23.
[78] BL MS Sloane, 4058, f. 25. The top of the letter is missing but it is clear that Blair is addressing Sloane and that it was an early reflection on the pamphlet he recently received. Though he refers to 'Molyneux' in the letter, the content of the letter make sense in the context of Moulin's work on the elephant. It is possible that he confused one Irish doctor for another—but the only thing published by a Molyneux in this period that dealt with animal bones was an article on the Irish elk that did not portray any bones. Thomas Molyneux, "A Discourse

Blair planned on improving more than the images, however. He saw himself not only as filling in the gaps that Moulin missed— not so much from ignorance as from his unfortunately burnt specimen— but as continuing a conversation. Thus, where Moulin was unable to observe something, like the muscles on the proboscis, Blair took particular care to describe it minutely from his notes.[79] Blair discussed the elephant's reproductive system at length for a similar reason. Though he noted that this topic was "the most taken notice of in Comparative Anatomy," he also was keenly aware that Moulin had dissected a male elephant, and he had dissected a female one.[80] With an anatomical account of both species, he hoped he could use anatomical evidence to settle a question about which both classical and contemporary authorities disagreed: how elephants reproduced.

In his dedicatory epistle, Blair noted that he, Moulin, and Antonie Van Leeuwenhoek (who had published a short account of an elephant in the *Philosophical Transactions*) all disagreed on elephant reproduction.[81] This disagreement stemmed from a much older one that dated back to classical antiquity. With the increased availability of elephants, modern authors jumped into the fray. When he was in the Hauge, Leeuwenhoek saw a female show elephant.[82] While examining the creature, he noticed that its vagina was "not situated, as it usually is in our four-footed Beasts, under the Tail, but in the Belly, and very near the part where the Navel grows." This, he wrote

> appear'd to me to be a very particular Discovery; the more, because I remember'd I had often read, that when the time came for the Copulation of Elephants, the Female

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Concerning the Large Horns Frequently Found under Ground in Ireland," *Philosophical Transactions,* no. 19 (1695): 489-512.
[79] Blair, *Ostographia Elephantina*, p. 25.
[80] Blair, *Ostographia Elephantina*, p. 34.
[81] Blair, *Ostographia Elephantina*, f. a1^{r}.
[82] Anthony van Leeuwenhoek, "Some Remarks upon the Disposition of the Parts, and Microscopical Observations upon the Contexture of the Skin of Elephants," *Philosophical Transactions* 27 (1710): 518-522.

> Elephant used to prepare herself a Bed with the Boughs of Trees, and then cast herself upon her Back on them; but none of the Authors that I had read, gave their Reasons for her doing so.[83]

From his observations, Leeuwenhoek believed that he had found an anatomical reason for the strange mating habits of elephants described in the works of Pliny and others. While this at first glance this seemed to give more evidence for Pliny's observational skills, the matter was complicated by the fact that Aristotle disagreed with Pliny's account. But more to the point, neither Blair (who agreed with Aristotle) nor Moulin (who had a totally different view altogether) made observations that corresponded with Leeuwenhoek's account. Moulin's contention was especially puzzling, since he claimed that elephants were retrocoient—something that neither Pliny nor Aristotle asserted. Moulin based his assertion on two points of evidence. He did examine the animal's penis, but because it had been so inexpertly removed, the remains left little anatomical evidence. So, he also questioned the animal's attendants, who told him that it was retromingent (that is, that it urinated backwards).[84]

Although Blair did not want to "call so Ingenious a Gentleman's Authority in question," he nevertheless could not agree with Moulin's account because the evidence he presented was unsuited to the standards of evidence of the era. On the first point, his argument was based on something he was told about the animal in life, not what he saw postmortem.[85] It was entirely possible that the animal was retromingent, Blair argued, but that this could not be taken as evidence that it was retrocoient, especially based on what he found when he dissected the female. Moreover, Blair argued that Moulin's account

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[83] Leeuwenhoek, "Remarks upon Elephants," pp. 518-519.
[84] Moulin, *Anatomical Account,* p. 15.
[85] Blair, *Ostographia Elephantina*, p. 32.

simply did not make anatomical sense. The latter described the penis as "bigger than that of a Horse, but not so long," meaning, Blair argued, that "it can hardly be suppos'd to bend backwards, ascend again, and enter the Vagina so far as is requisite."[86] Since Blair had carefully dissected and measured his female elephant's reproductive system, he knew that this was physically impossible. Similarly, Blair also disagreed with Aristotle, who wrote that the animal gave birth to one offspring at a time. When he dissected the uterus, he found that it had several protuberances for holding more than one fetus in utero, as was the case in cats, hares, and dogs. Blair argued that all accounts to the contrary (even firsthand accounts of travelers who had seen them in their natural habitats) were incorrect because they were not based on an examination of interior forms. Physical evidence from anatomy was more persuasive than anything else, even observing an animal from life.

Not only did the new anatomical program change the site of knowledge gathering from the exterior to the interior, but it also used images in a fundamentally different way and deployed new technologies of observation. A new iconography associated with natural history took shape in the late 1660s, one that was repeated and perfected in atomical works over the course of the next few decades.[87] As with the text, the images in these works emphasized internal structures over exterior forms, and the images themselves were important conduits for conveying information even outside of any accompanying text. We see this in Moulin's discussion of osteology, where noted that he would not trouble himself with creating a written description of every bone. Instead, he asked Petty to hire an artist to create an image of the articulated skeleton.[88] Before publishing the pamphlet, the Royal

[86] Blair, *Ostographia Elephantina*, p. 34.
[87] Sachiko Kusukawa, *Picturing the Book of Nature: Image, Text, and Argument in Sixteenth-Century Human Anatomy and Medical Botany* (Chicago: University of Chicago Press, 2012).
[88] Moulin, "Anatomical Account," pp. 38-9

Society had to negotiate with Dockwra to gain access to the articulated specimen and its associated parts to draw them. These artists created one plate of the entire skeleton with the tusks, with a second plate depicting a detailed representation of the penis, eye, and a view of both the front and inside of the skull. **[Figures 5.3 and 5.4]** The first was hardly an exact portrait, and Moulin complained that "through the painter's neglect," the image did not include the cartilage of the ribs and sternum.[89] Though he appreciated that creating images was a skill, these artists frustrated Moulin in the same way that the butchers did. While these craftspeople were proficient at what they did, they did not always do things in the way that Moulin wanted them to.

Getting artists to accurately depict what an author saw was a problem that plagued many learned people from anatomists to antiquarians.[90] This was doubly difficult when the artist's knowledge level about anatomy did not match that of the anatomist. The former, told to draw the bones, drew the bones. The latter realized only after the image was executed that he should have been more explicit: the missing pieces were cartilage, not bone. While Moulin assumed that it was a point so obvious it did not need making, the artist did not see it that way. Here, we see an added layer of complexity in how Pamela Smith described about the importance of artisans in the Scientific Revolution.[91] She convincingly argued for the value of the artisan's workroom as a kind of trading zone where two groups of people—artisans and experimental philosophers—worked in tandem

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[89] Moulin, "Anatomical Account," p. 65.
[90] For antiquarians, see Francis Haskell, *History and Its Images: Art and the Interpretation of the Past* (New Haven: Yale University Press, 1993).
[91] Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago: Chicago University Press, 2004). See also the essays in Pamela H. Smith, Amy R. W. Meyers, and Harold J. Cook, eds., *Ways of Making and Knowing: The Material Culture of Empirical Knowledge* (Ann Arbor: University of Michigan Press, 2014).

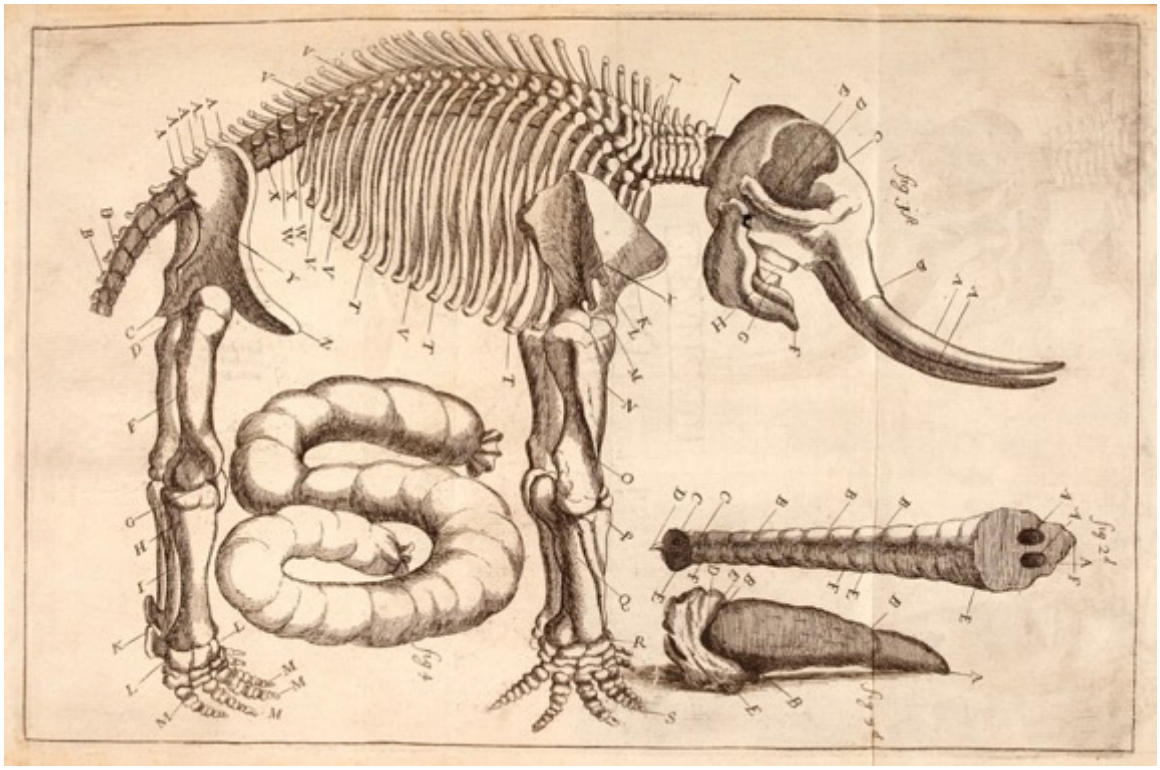

Figure 5.3: Skeleton, Allen Moulin, *Anatomical Account of an Elephant*, 1682

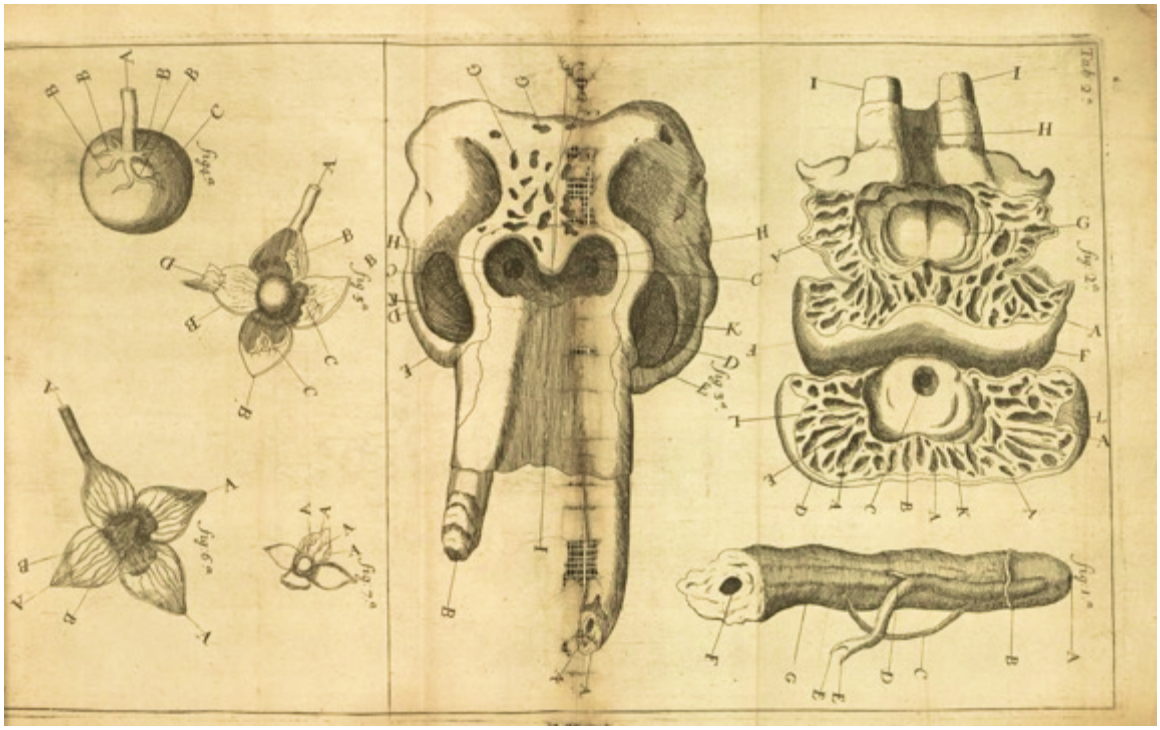

Figure 5.4: Head and organs, Allen Moulin, *Anatomical Account of an Elephant*, 1682

to create new knowledge.[92] This skill transfer, however, was still awkward and imperfect in some cases, where one person's expertise did not match another's interpretation what was essential or even important about natural phenomena.

Images played even more of a central role for Blair, and he also needed to negotiate with skilled practitioners to create them. He thought Moulin's images were terrible and "so ill delineated." As a result, he wrote that he would "spare no pains nor cost to have mine truly drawn and exactly cut" rather than "employing another to cut the figures at a distance who had no idea of them" as Moulin had.[93] Though Blair acknowledged that there were more competent engravers in London than in Dundee, their skill would mean nothing if he was not able to "to correct in the Ingravings what Errors happen'd in drawing the Figures." Blair would not even consider traveling to London to oversee the work since the specimens could not travel, and would remain in Scotland.[94] He had both the engravings and the printing done in Scotland, but this separation of work was not without its peril, in this case, because the papers "were hastily pack'd up and perhaps been desposed to the air since I'm afraid several of them is [sic] spoilt."[95] As Sachiko Kusukawa argued, the mixed communities of printers, illustrators, and scholars—as well as the personal and professional relationships between them—were crucial in producing both images and knowledge.[96] Blair understood this. In order to fully appreciate each other's

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[92] On the trading zone, see Peter Galison, *Image & Logic: A Material Culture of Microphysics* (Chicago: The University of Chicago Press, 1997). On trading zones in early modern studies, see Pamela O. Long, *Artisan/Practitioners and the Rise of the New Sciences, 1400-1600* (Corvallis: Oregon State University Press, 2011) and Pamela O. Long, "Trading Zones in Early Modern Europe," *Isis* 106, no. 4 (2015): 840-847.
[93] BL MS Sloane 4058, f. 25.
[94] Blair, *Ostographia Elephantina*, p. 100.
[95] BL MS Sloane 4025, f. 49-51.
[96] Kusukawa, *Picturing the Book of Nature*.

expertise, the anatomist and the artist needed to work together to create the final images.

Creating these images was also expensive. Blair wanted the Royal Society to cover some of the costs—after all, they had the images done for Moulin's work. Unfortunately, he was unsuccessful. "You seem'd to be surprised," he wrote to Sloane, "at the charges I sent to you of the copperplates. Let not that move you, do in it as you please; I never was mercenary."[97] Still, Blair was willing to incur both the cost of the engraving and printing the plates, suggesting that the presence and the integrity of the images was a central concern for him. In describing Conrad Gesner's 1555 *Historiae Animalium*, Laurent Pinon argued that "the real basis of Gessner's zoological discourse is not the animals themselves. […] While Gessner's zoology could exist in a world without animals, it is not conceivable in a world without books."[98] Blair's work was a radical shift away from this. Books could be done away with, but anatomical natural history was not only inconceivable without the animals, but it was also impossible without the animals' forms recreated on paper.

Copper engraving also allowed a greater level of detail in the images created in the seventeenth century. The lines were finer, allowing a greater level of detail than even the best woodcuts could give. Finer lines also allowed for smaller images, and the ability to include a greater number of figures on the same sized sheet of paper. However, because of the way they were printed, they had to be done separately and added to the back of the text. This, Pinon argued, led to images losing their privileged place at the heart of the information and becoming something supplemental.[99] However Blair's text shows that

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[97] BL MS Sloane 4025, f. 49-51.
[98] Laurent Pinon, "Conrad Gessner and the Historical Depth of Renaissance Natural History," *Historia: Empiricism and Erudition in Early Modern Europe*, Gianna Pomata and Nancy Siraisi, eds. (Cambridge, MA: The MIT Press, 2005), pp. 250-251.
[99] Laurent Pinon, *Livres de Zoologie de la Renaissance* (Paris: Klincksieck, 1995), pp. 25-30.

although the images were not physically present, they were in no way ancillary. If anything, because he continuously referenced them in the text itself, their spatial separation brought them more forcefully into the conversation. His pamphlet had four plates in total: one was of the stuffed elephant, another of the articulated skeleton, both pictured as they were presented on the checkered flood of the Dundee Hall of Rarities. **[Figure 5.5]** The third contained engravings of various internal structures, and the fourth several close ups of bones. In total, there were dozens of figures swimming in a veritable alphabet soup of majuscules and minuscules. **[Figure** 5.6**]** These images were created before any of the text had been compiled from his notes and the first thing Blair sent Sloane was not a draft of the work, but a copy of the engravings. The priority of the visual elements, then, was both chronological and intellectual.

Compare, for example, an earlier anatomical book—Andreas Vesalius's *De humani corporis fabrica* (1543), a work known for the beauty, lavishness, and novelty of its images.[100] The book was printed by Johannes Oporinus, a Basel-based printer who specialized in high-quality books for a learned market.[101] Before the work was printed, Vesalius gave his printer a letter with detailed instructions about the images which was reproduced in full in the *Fabrica*.[102] The letter shows the importance Vesalius placed on his images. Rather than have the woodblocks cut in Basel, he insisted that the work be done in Italy, where he could oversee their production. Though part of his insistence on overseeing the artists' work was to thwart pirates who might copy his work and reproduce

[100] On how readers interacted with Vesalius's images, see Dániel Margócsy, Mark Somos, and Stephen N. Joffe, eds. *The Fabrica of Andreas Vesalius: A Worldwide Descriptive Census, Ownership, and Annotations of the 1543 and 1555 Editions* (Leiden: Brill, 2018), pp. 78-94.
[101] Ann Blair, *Too Much to Know: Managing Scholarly Information Before the Modern Age* (New Have: Yale University Press, 2010), p. 195.
[102] Vesalius, *De humani corporis fabrica: libri septem*, f. a 4^{v}.

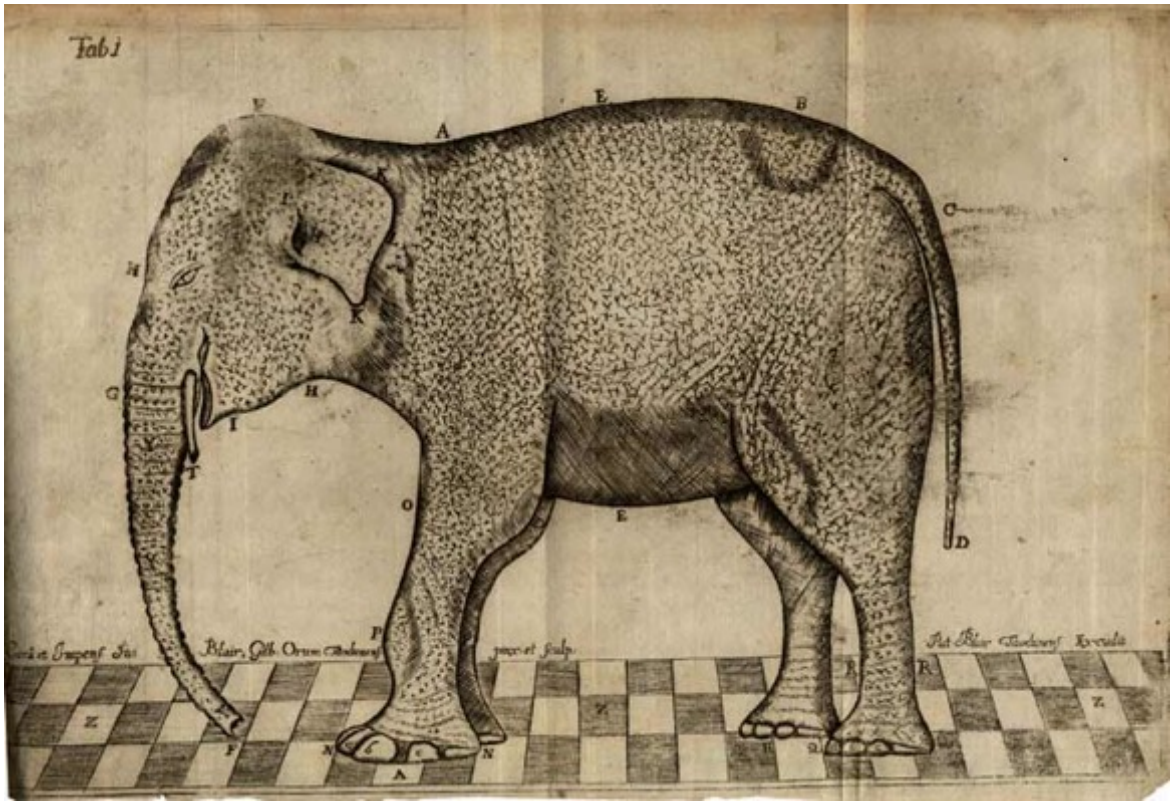

Figure 5.5: Stuffed elephant, Patrick Blair, *Ostographia Elephantina*

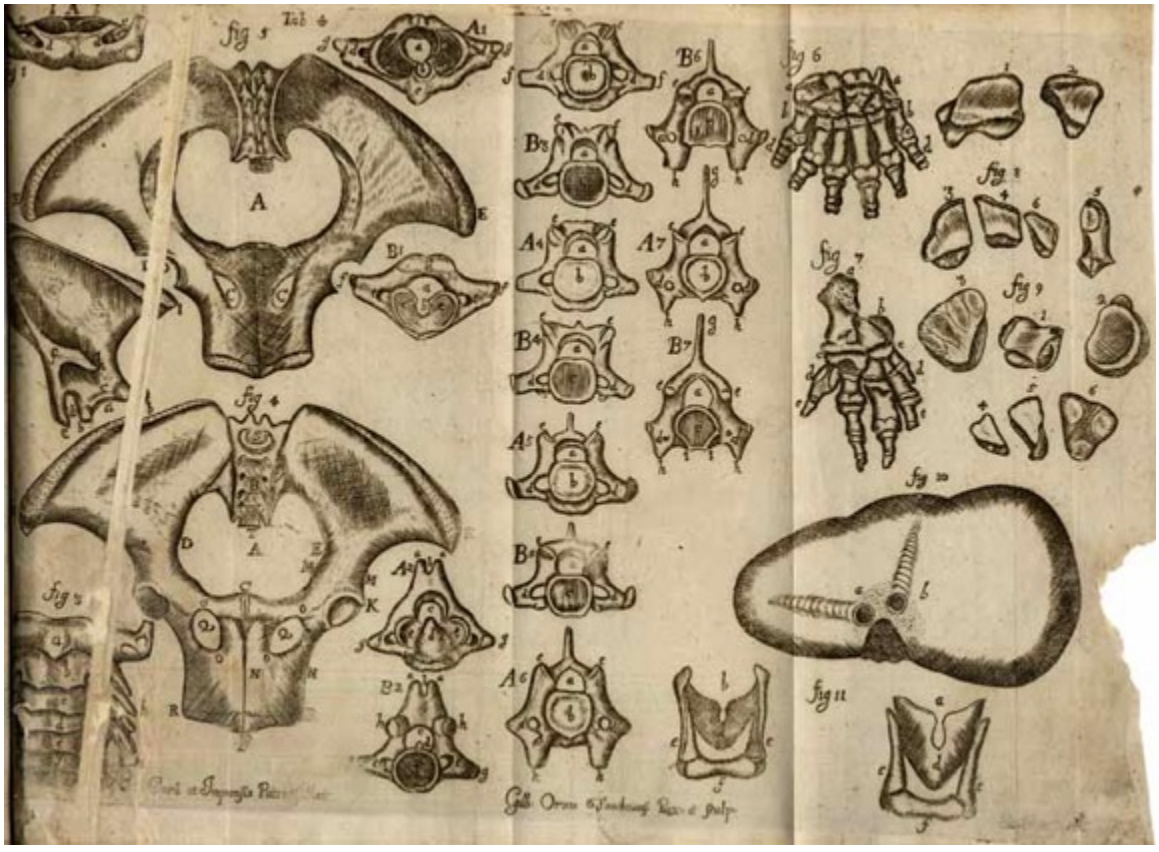

Figure 5.6: Osteology, Patrick Blair, *Ostographia Elephantina*

cheaper versions of it, a main reason was because of the overwhelming complexity not just of the images, but of the typographic technology used to read them.[103] In describing the images, Vesalius underscored their separation from the text. The textual discussion of the image, he instructed, was to be put in the heading of the chapter that included the image, and he asked that a visual delineation be made between the explanation of the figures (set in italic type), and the body of the text (set in roman). "You will readily observe from the proof," he wrote, "where the type of characters must be changed." Also, he specifically asked that the text be continuous and "nowhere interrupted by reference to figures."[104] Any commentary about the images was to appear only in the inner margins. For Vesalius, images—though important—were never intended to be part of the text itself and he took pains to keep them separate. This changed with later seventeenth century anatomical treatises. For Blair, despite the physical separation of the words and the image forced by technological limitations, the images integrally intwined with the text and he referenced them constantly. They were of central importance not only to his own work, but they would become indispensable for other works that examined animals in a systematic way.

Both Moulin and Blair's pamphlets demonstrated a growing sense that to do anatomy, one needed to depict as well as describe the process. However, in their respective works, they both lamented that they could not resolve the animal into its smallest possible

[103] On Vesalius' fears of copycats, see Harry Clark, "Foiling the Pirates: The Preparation and Publication of Andreas Vesalius's *De Humani Corporis Fabrica," The Library Quarterly: Information, Community, Policy* 51, no. 3, (1981): 301–311.
[104] Andreas Vesalius, "To Johannes Oporinus*,"* in John Bertrand deCusance Morant Saunders and Charles D. O'Malley, eds and trs., *The Illustrations from the Works of Andreas Vesalius of Brussels* (New York: Dover, 1973), p. 46.

parts—that they did not have access to microscopes.[105] To do a proper anatomy, they thought, one also ought to use the specialized instruments that were rapidly becoming beyond the means of more casual practitioners. In *Leviathan and the Air Pump,* Simon Schaffer and Steven Shapin explored how experimental philosophy— something seen as paradigmatic of modern science— came to be accepted as the proper way for advancing science. They argued that at the heart of the experimental program was the practice of establishing "matters of fact." For them, the mechanics were tripartite: material, literary, and social technologies intertwined to make up matters of fact.[106] Material aids were thus tremendously important, and they argued that instruments became emblematic of the Royal Society's experimental program. In particular, the importance of newly perfected scientific apparatuses like air pumps, telescopes, and microscopes lay in their power to "enhance perception and to constitute new perceptual objects."[107] Robert Boyle was particularly keen on using instruments, arguing that "the Informations of Sense assisted and highlighted by Instruments are usually preferable to those of Sense alone."[108]

However, these material technologies were often difficult and costly to construct and hard to come by. Boyle's air pump was fantastically expensive, and control of access to it

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[105] On microscopes in early modern science, see Edward G. Ruestow, "Images and Ideas: Leeuwenhoek's Perception of the Spermatozoa," *Journal of the History of Biology* 16, no. 2 (1983): 185–224; Catherine Wilson, *The Invisible World: Early Modern Philosophy and the Invention of the Microscope* (Princeton: Princeton University Press, 1995); Edward G. Ruestow, *The Microscope in the Dutch Republic: The Shaping of Discovery* (Cambridge: Cambridge University Press, 1996); David Freedburg, *Eye of the Lynx: Galileo, His Friends, and the Beginnings of Modern Natural History* (Chicago: University of Chicago Press, 2003), chapters 6-7; Domenico Bertoloni Meli, *Mechanism, Experiment, Disease: Marcello Malpighi and Seventeenth-Century Anatomy* (Baltimore: The Johns Hopkins University Press, 2011), chapter 1.3. Microscopy in the service of zoology became much more prominent in the eighteenth century, see Marc J. Ratcliff, *The Quest for the Invisible: Microscopy in the Enlightenment* (Farnham: Ashgate Publishing Limited, 2009).
[106] Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton University Press, 2011), chapter 2.
[107] Shapin and Schaffer, *Leviathan and the Air Pump*, p. 36.
[108] Quoted in Shapin and Schaffer, *Leviathan and the Air Pump*, p. 36.

was just one more way that these scientific instruments disciplined sensory observation. Microscopes were not as inaccessible as air pumps, and anatomists had already begun to use them in their research. Malpighi used the microscope to study everything from the formation of an embryo to minute structures in the skin, kidneys, and liver. His anatomical rival Nicolas Steno also emphasized using the microscope.[109] However, neither Moulin nor Blair had one. While Moulin hoped to use this anatomy to throw "light into the true uses of parts" of all animals, he apologetically wrote to Petty that he "cannot answer such great expectations," since his "want for Optick Glasses and of other helps for curious observation were considerable."[110] Though naked eye observation still fit in the empirical and inductive model so prized by Boyle, Moulin believed that he would have gotten better information if he had access to new technology.

After Blair's *Ostographia* appeared in the *Philosophical Transactions*, the Royal Society printed a letter from the Dutch microscopist Antoine van Leeuwenhoek about his reminiscence of the live elephant exhibited in the Hague. After attempting an external observation of her genitalia to come to a conclusion about matters of elephant reproduction, he turned to the elephant's skin. This animal was still alive when Leeuwenhoek saw it, so an anatomy was out of the question. He was able, however, to convince its keeper—after assuring him that he would be well remunerated in the matter—to cut off some of the elephant's skin. Leeuwenhoek wanted to observe it under a microscope. "My design in separating or dividing these Particles," he told the Royal Society, "was to see if I could discover in them any thing that was worth Notice."[111] He

[109] Jim Bennett, "Malpighi and the Microscope," in *Marcello Malpighi Anatomist and Physician*, Domenico Bertoloni Meli, ed. (Florence: L.S. Olschki, 1997), pp. 63–72.
[110] Moulin, *Anatomical Account,* pp. 3-4.
[111] Leeuwenhoek, "Remarks upon Elephants," p. 521.

was not looking for anything in particular, he just had the conviction that magnified sight would reveal to him something previously unknown about elephants. It turned out that he was able to make an unexpected discovery—he had originally thought that elephants were hairless. However, a more minute examination of the skin revealed several short, small hairs that were invisible to the naked eye, but not to the aided one. He had the results of his microscopic investigations drawn up and printed—though he complained, as had so many other authors before him, that what appeared to the artist's eye was not what appeared to his own.

Perhaps seeing Leeuwenhoek's letter as part of a growing resurgence of interest in elephants, the Royal Society decided to republish Blair's earlier articles together in a pamphlet in 1713. The content was identical, but it began with a dedicatory epistle that explained the reason for the reprint. In it, Blair noted that he wanted to address Leeuwenhoek's claims directly. Blair disagreed with the two non-microscopic observations that Leeuwenhoek advanced (on how elephants reproduced, and the assertion that the mother elephant sucked milk from her own teat and fed her young from her trunk), though he did in general agree with Leeuwenhoek's assertion about microscopic hairs because he made the observation with "so subtile an Assistant."[112] Blair did not agree with what Leeuwenhoek's interpretation of the function of the pores from which the hairs grew, but he did not argue about their existence. In other words, Blair believed in what he could not see because he trusted that the instrument revealed true characteristics about an organism. In this new way of investigating animals, naturalists delved deeper into internal structures—first to cut the body open, but later to examine it with the microscope.

[112] Blair, *Ostographia Elephantina*, f. A1[r].

It was serendipitous that two elephants died within a 30-year span of one another, both close enough to someone interested and capable enough to perform a systematic study of them in accordance with the best practices of the day. Elephants had, to borrow a phrase from Paula Findlen, an inherent spectacularity, so it was less unexpected that their anatomies were published.[113] Their remarkableness made people take notice, but elephants were precarious commodities in this period and their anatomy was done more by blind chance than planned design. Around the same time that Moulin and Blair were dissecting their respective elephants, some members of the Royal Society set up a project along similar lines to what these two men had done independently. Again, they chose an animal that was interesting enough to capture attention, but not so rare that they had to depend on luck and the indulgence of benevolent owners to anatomize it. So, they turned to their contacts in the English colonies in America to send over not only the more customary written reports, but also barrels full of American rattlesnakes.

Barrels of Rattlesnakes

In a chapter of William Wood's *New England Prospect* (1639) dedicated to the "evills, and such things as are hurtfull," William Wood described the most dangerous animal of the region, the rattlesnake. It got its name, he explained, because of the appendage on its tail, which made a noise when the snake was threatened. It was a fearsome beast indeed, with

[113] Findlen, *Possessing Nature*, p. 221. On the inherent spectacularity of elephants in particular, see Kurt Koenigsberger, *The Novel and the Menagerie: Totality, Englishness, and Empire* (Columbus: The Ohio State University Press, 2007), pp. 12-13.

> teeth as sharpe as needles, wherewith she biteth such as tread upon her. […] When any man is bitten by any of these creatures, the poison spreads so suddenly through the veins and so runeth to the heart, that in one houre it causeth death.[114]

As with many New World animals that did not exist in Europe, rattlesnakes attracted attention, and Wood was hardly the only author who wrote about them, leading John Ray to comment to his fellow naturalists Tancred Robinson that the English knew more about American snakes than African ones, even though the latter were geographically much closer. He thought this was the result of detailed descriptions of these snakes in works like Willem Piso and Georg Marcgrave's *Historia Naturalis Brasiliae* (1648) and Francisco Hernandez's *Rerum medicarum Novae Hispaniae* (1628), and the relative abundance of their exuviae in museums.[115] The Royal Society itself had nineteen skins and "several rattles," and similar items appear in dozens of other catalogs of early modern collections.[116] These specimens were so overabundantly present that a century after Wood's *New England Prospect*, an unnamed author gave a paper before the Royal Society where noted with some bemusement that "some people in England […] fancy every corner of [New England] so much pester'd with [rattlesnakes], that a man goes in constant danger of his life that walks around in the woods. But this is as gross a mistake as the most of the other idle reports of

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[114] William Wood, *New England Prospect* (London: John Dawson, 1639), p. 39.
[115] John Ray to Tancred Robinson, March 10, 1690, in John Ray, *The Correspondence of John Ray,* Edwin Lankester, ed. (New York: Arno Press, 1975), pp. 241-244. Though the rattles do not shed with the rest of a rattlesnake's skin, they do break off easily, and because the broken rattles still made noise, they were attractive to add to early modern collections.
[116] Nehemiah Grew, *Musaeum Regalis Societatis, or, A Catalogue & Description of the Natural and Artificial Rarities Belonging to the Royal Society and Preserved at Gresham College* (London: W. Rawlins, 1681), p. 52. James Salter had so many he didn't even bother to list their number in his catalog, see *Catalog of the Rarities to be seen at Don Saltero's Coffeehouse* (London: Theodore Edlin, 1729), pp. 10-11, 16. "A Catalog of Rarities Belonging to Will. Walker," BL, MS Sloane 1968, lists "sundry rattles of snakes," pp. 173-173; Other inventories of English collections listing rattlesnakes can be found in Bodleian Library, MS Ashmole 1820A, pp. 22-23; "Catalogus Rariorum in schola Anatomica Oxoniensi," Bodleian Library, MS Rawlinson D 912, pp. 203-204.

this country."[117] Given the large numbers of rattlesnake parts in public museums, as well as the fact that around the same time this paper was read, Londoners could go see two live snakes for a sixpence at a local coffeehouse or visit the specimens kept in the garden of the Royal College of Physicians, the English could be forgiven for thinking that North America was overrun with the creatures.[118]

Since they were a relatively common exotic animal, speculation about them ran rampant. Based on both written accounts and eyewitness testimony, no one seemed to agree with what exactly made this animal so dangerous.[119] Some thought it was the animal's breath that killed. writing in 1672, John Josselyn averred that the animal "poysons with a Vapour that comes through two crooked Fangs in their Mouth."[120] William Wood debunked that myth, writing that while it was clear that the rattlesnake was dangerous, it was "nothing so bad as the report goes of him in England," where stories abounded of its fatal mephitic breath, one huff of which could kill a person in their tracks, after which the snakes would literally fly away (though of course they had no wings).[121] Thomas Morton had a different theory. "It is simplicity in any one that shall tell a

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[117] "About the charming and poison of Rattle Snakes," BL, MS Sloane, 1968, pp. 208-212.
[118] Robert McMracken Peck, "Alcohol and Arsenic, Pepper and Pitch" Brief Histories of Preservation Techniques," in *Stuffing Birds, Pressing Plants, Shaping Knowledge: Natural History in North America, 1730-1860,* Sue Ann Prince, ed. (Philadelphia: American Philosophical Society, 2003), pp. 39-41.
[119] The question of snake virulence was not confined to rattlesnakes. Francesco Redi was involved in a dispute with Moyse Charas about the nature of the venom of the viper. See Francesco Redi, *Osservazioni intorno alle vipere*, (Firenze: All'Insegna della Stella, 1664); Moyse Charas, *New Experiments Upon Vipers: With Exquisite Remedies That May Be Drawn from Them As Well for the Cure of Their Bitings, As for That of Other Maladies : Also a Letter of Francisco Redi, Concerning Some Objections Made Upon His Observations About Vipers…* (London: Printed for Mark Pardoe, 1677); Jutta Schickore, "Trying Again and Again: Multiple Repetitions in Early Modern Reports of Experiments on Snake Bites," *Early Science and Medicine* 15, no. 6 (2010): 567-617.
[120] John Josselyn, *New-Englands Rarities discovered: in Birds, Beasts, Fishes, Serpents, and Plants of that Country* (London: G. Widdowes, 1672), p. 38.
[121] Wood, *New England Prospect*, p. 39.

bugbeare tale of horrible, or terrible, serpents that are in this land," he wrote in his *The New English Canaan* (1637). The rattlesnake, he argued, was no more harmful than the common English adder, and its bite was none too bad. He reported that one bit his dog, but the common English snakebite cure—"one Saucer of Salet Oyle powred downe his throate"—the dog was fine. "The like experiment," he wrote, was done with the same effect on a young boy.[122] Their potentially dangerous bite made rattlesnakes of interest to seventeenth century travelers, even if not all agreed that it was fatal.

Some authors were convinced that the snakes were dangerous, but that their ability to kill had nothing to do with their breath or their bite. Instead, they argued that rattlesnakes had the power to mesmerize their prey. Stories abounded about how they looked at their prey with fathomless, unblinking ink black eyes and waited with open mouths for birds and squirrels to fall unresistingly from tree branches into their gullets. One inhabitant of Virginia told the Royal Society about his own experiences in May of 1715, where

> we were entertain'd with the whole process of charm between a Rattle-Snake and a Hare. […] It happened thus: one of the company […] espied the Hare sitting and altho' he went close by her she did not move, till he (not suspecting the occasion of her gentleness) gave her a lash with his whip; this made her run about ten foot, and there sit down again. The Gentleman […], immediately return'd the same way, and near the place where he struck the hare, he spied a Rattle-Snake; still not suspecting the charm, he goes back about 20 yards to a Hedge to get a stick to kill the snake, and at his return found the snake removed, and in the same place from whence he had moved the Hare. This put him into immediate thought at looking for the Hare again and he soon spied her about ten foot off the snake, in the same place to which she had started when he whipped her.[123]

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[122] Thomas Morton, *New English Canaan or New Canaan. Containing an Abstract of New England, Composed of three Books* (Amsterdam: Jacob Frederick, 1637), pp. 82-83.
[123] BL MS Sloane 1968, pp. 208-213.

The hare was so charmed, he continued, that it put up no resistance to its predator, who sidled up and swallowed it whole. The person relating the story, curious observer that he was, took the band from his hat and fashioned a noose and trapped the snake and brought it back to town. He had wanted to send the live animal to have it anatomized by a physician he knew in Williamsburg, but the person on whose boat they were traveling refused to let the animal aboard. Not wanting to waste the opportunity for dissection, the author decided to cut the animal open himself. Though he had great faith in the illuminating power of post-mortem examination, he reported that the exercise did not yield any physical structure that shed light on its ability to charm.

Fascination, as many early modern observers called this ability, was a highly controversial subject.[124] Hans Sloane was sure that the stories were just that—stories, but William Byrd Jr., (who supplied the Royal Society with many American animals, including rattlesnakes) was adamant that this animal procured its prey by this power, and that it acted on humans as well. "I assure you," he wrote in a letter to naturalist Mark Catesby, "I have ogled a Rattlesnake so long, till I have perceived a sickness in my stomach."[125] Others—based on their own personal observation and reports of indigenous and European American inhabitants— reported that the story was false.[126] Who was to be

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[124] On the stories told about the rattlesnake's fantastic killing powers, see James R. Masterson, "Travelers' Tales of Colonial Natural History," *The Journal of American Folklore* 59, no. 232 (1946): 174-188; David Scofield Wilaon, "Rattlesnake," in *American Animals in Symbolism and Story,* Angus K. Gillespie, Jay Mechling, eds. (Knoxville: University of Tennessee Press, 1987), pp. 41-72.

[125] Byrd to Catesby, June 27, 1737, in Marion Rose Tinling, ed. *The Correspondence of the Three William Byrds of Westover, Virginia, 1684-1776, Volume 2* (Charlottesville: University of Virginia Press, 1977), p. 519.

[126] See, for example, Randolph to Collinson, 22 August 1737, *Royal Society Letter book XXV*, p. 123-125. On English colonists' use of indigenous knowledge, see Susan Scott Parrish, *Cultures of Natural History in the Colonial British Atlantic World* (Chapel Hill: University of North Carolina Press, 2006), chapter 6.

believed? And by what standards was the Royal Society to judge? All these accounts were quick to point out that they were based on first-hand observations and were corroborated by both gentlemen and the Amerindians with whom they talked, yet there was no consensus. The debate over how rattlesnakes killed raged on, so the Royal Society sought to put the matter to rest by ordering a systematic natural history of the rattlesnake by dissection. The hope was that a detailed understanding of the animals' internal structures would shed light on how it killed its prey.

In 1682, the merchant Henry Loades received a shipment of naturalia from Virginia that included an American rattlesnake. He showed the animal to the Royal Society while it was alive and when it died, he gave them its corpse. This was hardly peculiar—since the first century of its existence, over 1,200 consignments of specimens were received into the society's repository of rarities.[127] However, in this case, instead of just drying and stuffing the skin and putting the body on display, the Royal Society decided that one of its members, Edward Tyson, would dissect it to observe its inner parts.[128] This 1683 dissection was one of many accounts—anatomical and otherwise—of this animal, but the Royal Society saw their dissection as a first step in a truly Baconian comparative anatomy. They had plans not just to dissect this individual, but whole swarms of them. This, they believed, would put to rest the unresolved questions surrounding the snake.

As a result, Tyson's discission of the rattlesnake, which was published in the *Philosophical Transactions*, prioritized what could be learned from dissection. He wrote that if readers wanted a traditional account of the animal, they could consult Piso, Hernández,

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[127] Raymond Phineas Stearns, *Science in the British Colonies of America* (Urbana: University of Illinois Press, 1970), p. 96.
[128] December 15, 1682, *Journal Book of the Royal Society*, Vol. 7; Edward Tyson, "Vipera Caudi-sona Americana, or the Anatomy of a Rattle-snake," *Philosophical Transactions*, no. 144 (1683), p. 26.

Nieremberg, or any other natural history. He instead focued on anatomy, which he considered to be "the most principal part in a Natural History of the Animals."[129] Just one dissection could not complete the history of "so curious an animal," however. Instead, he argued that it was only "frequent repeated Dissections [that] might fully inform us of Nature's admirable contrivance, and Mechanism of Animal bodies."[130] This, he conceded, was easiest for more common animals, but it was "mightily to be wisht that we had at least the most accurate account, and exact Anatomy, of one of every distinct Species of Animal." Just as Adam had named all the animals, Tyson hoped that a collective Adamic anatomical program would eventually provide scholars with a comprehensive account of the interior structures of all animals, something just as (if not more) important as their names.[131] On the latter count, Tyson also wanted to make his mark. He noted that although this animal was sometimes referred to by various names—transcriptions of indigenous names as well as vernacular names in Spanish, Portuguese, and Dutch—it still did not have a systematically used Latin name. He proposed *vipera caudisona americana*, a name not based on the animal's external characteristics, but on interior ones. He wrote that he classed it as a viper not because it looked like one, but because he *cut it up* and it looked like one.[132] Throughout his work, Tyson's main interest was clearly anatomy, and he viewed dissection as the most important tool for solving all the unresolved issues about the animal, from its Latin name to accounts of its singular behavior.

Rattlesnakes had several unusual behaviors, some of which they shared with other animals. Why some creatures entered a suspended state in the winter, for example,

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[129] Tyson, "Anatomy of a Rattle-snake," p. 26.
[130] Tyson, "Anatomy of a Rattle-snake," pp. 25-26.
[131] Tyson, "Anatomy of a Rattle-snake," pp. 25-26.
[132] Tyson, "Anatomy of a Rattle-snake," p. 25.

puzzled early modern naturalists. Hibernation was a well-known but poorly understood biological process. Aristotle noted in the *Histories of Animals* that bears, hedgehogs, and a variety of other animals slept through the deepest parts of winter without needing to eat.[133] Albertus Magnus, the thirteenth-century theologian who systematized Aristotle's work for a European audience, believed that this ability came from a nutritive power of the soul, but by the seventeenth century, naturalists rejected his explanation.[134] As interest in anatomy grew, they began to look for anatomical rather than metaphysical explanations for this phenomenon. Rattlesnakes also enter a suspended state during the winter.[135] To explain this, Tyson found that the snake he anatomized had two large "bladders" for lungs, which were comparative in size to those of other animals that spent a portion of the year sleeping. Just as animals took in a great deal of food before hibernation, he reasoned, they also took up a great store of air to sustain them through the winter. So, he argued, when travelers related that this snake was completely motionless in the winter and did not even breathe, they were correct.[136] He found the same large lungs in tortoises, who also spent

[133] Aristotle, *Histories of Animals*, Book VI part 30; see also Pliny, *Naturalis historiae*, Book 37, part 8.
[134] Bernd Roling, "Standstill or Death," in *Nutrition and Nutritive Soul in Aristotle and Aristotelianism*, ed. Giouli Korobili and Roberto Lo Presti (Berlin: de Gruyter, 2020), p. 341.
[135] According to modern zoological understanding, rattlesnakes do not hibernate. Instead, they and other reptiles enter a dormant state called brumation, see Frederic Zaidan III and Steven J. Beaupre, "Effects of Body Mass, Meal Size, Fast Length, and Temperature on Specific Dynamic Action in the Timber Rattlesnake (*Crotalus Horridus*)," *Physiological and Biochemical Zoology: Ecological and Evolutionary Approaches* 76, no. 4 (2003):447-458.
[136] What occurred during hibernation was a hot topic of research in the late seventeenth century Royal Society. A few years later, a Dr. Merret reported to the Royal Society that he had carefully weighed a tortoise before it buried itself for the winter, and again when it awoke again in the spring, and "found but an inconsiderable diminution of weight in the whole winter." That prompted John Hoskins to propose a set of vivisection experiments on "frozen" (i.e. hibernating) frogs to see if any movement could be discerned in their hearts "or whether there be not some motion and life remaining there," *Journal Book VIII*, December 3, 1690.

the coldest months in a suspended state, as well as in the *ſalamanđera aquatica*, which did not hibernate, but did spend a good deal of time underwater.[137]

Tyson explained this behavioral phenomenon not just through an individual anatomy but through a sustained program of comparative anatomy that sought to explain a behavior shared by many animals by finding a physiological commonality. He did the same when he explained how rattlesnakes went so long without eating. In his dissection, he noted that there was a protuberance attached to its gullet, which he argued was analogous to the crop in birds that stored food that could not fit in their stomachs. Tyson went on to reason that these sacks also explained "what is so confidently reported by many to be true," that in times of danger, the mother rattlesnake invited her offspring into her mouth for safekeeping.[138] Tyson, like the elephant anatomists before him, reasoned from anatomy to behavior.

Though Tyson and the Royal Society were interested in questions of hibernation and abstention from eating, the main concern about rattlesnakes in the era (especially for English colonists in the snake-infested lands of Virginia) was what made them so deadly. As a result, a large portion of the "Anatomy of a Rattle-snake," dealt with the snake's "Poysonous Teeth." "Indeed," Tyson noted, "scarce any Subject in Philosophy has admitted more controversy's than this of the Poyson of Vipers; in what it consists, what it is, and how it produces it's dire effects."[139] Rattlesnakes added another valence to this issue: was it poison or mesmerizing power that the snake used to kill its prey? Tyson intended to put the swirling theories to rest by answering that question anatomically. He

[137] Tyson, "Anatomy of a Rattle-snake," pp. 29-30.
[138] Tyson, "Anatomy of a Rattle-snake," pp. 32-33.
[139] Tyson, "Anatomy of a Rattle-snake," p. 46.

carefully dissected the animal's mouth, revealing what he called the lesser and greater teeth. While the lesser teeth could do bodily damage to the snake's prey, Tyson was convinced that it was the greater teeth that caused death. He began with an analogy: just as a cat or a lion unsheathed its claws to fight, rattlesnakes too could extend its teeth when it was threatened. Next, he turned to the structures themselves. He noted that in all the greater teeth (but none of the lesser), pushing on the gum forced a yellowish oily liquid out of a hole that ran through the tooth, what he called "poysonous Liquor."[140]

The composition of this liquid in all snakes (not just rattlesnakes) was a heated question the scholarly literature of the time. The apothecary Moïse Charas and physician Francesco Redi publicly debated whether the liquid from snakes' fangs was poison (which was Redi's position) or merely harmless saliva (Charas' position).[141] Tyson agreed with Redi, but interestingly, his position did not come from experiment—in fact, he did not test the poisonousness of the liquid at all. Both Charas and Redi, Tyson told his readers, based their arguments on experiments with the liquid, but still came to two different conclusions. In this case, experiment had proven inconclusive.[142] Tyson hoped that anatomy rather than experiment would definitively answer this question. He argued that the shape of the teeth themselves proved that the liquid could be nothing other than poison since they were

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[140] Tyson, "Anatomy of a Rattle-Snake," p. 45.
[141] Moyse Charas, *Nouvelles Experiences sur la Vipere, ou l'on verra une description exacte de toutes ses parties, la source de son venin, ses divers effets, et les remedes exquis* (Paris: Olivier de Varennes, 1669) and Moyse Charas and Francesco Redi, *New experiments upon vipers: with exquisite remedies that may be drawn from them as well for the cure of their bitings, as for that of other maladies : also a letter of Francisco Redi, concerning some objections made upon his observations about vipers written to Monsieur Bourdelot and Mr. Alex. Morus : together with the sequel of new experiments upon vipers, in a reply to a letter written by Sign. F. Redi* (London: Mark Pardoe, 1677). See also Patrizia Catellani and Renzo Console, "Moyse Charas, Francesco Redi, the Viper and the Royal Society of London," *Pharmaceutical Historian: Newsletter of the British Society for the History of Pharmacy* 34, no. 1 (2004): 2-10; Jutta Schickore, *About Method: Experimenters, Snake Venom, and the History of Writing Scientifically* (Chicago: University of Chicago Press, 2017).
[142] Tyson, "Anatomy of a Rattle-Snake," p. 46.

> so sharp and strong at the ends, and the slit too plac'd towards the back, not inside of the Tooth; what can be more conveniently contriv'd both for making the wound and infunding the Poyson? For if the slit was inwards, by the struggling and withdrawing of the Animal assaulted, this slit would be apt to be stopt and occluded; and the descent of the poyson prevented; but being thus formed it gives a greater advantage for its infusion."[143]

His argument was both anatomical and teleological. Since the positioning of the sharp fang, the slit, and the hollow channel that held the oily liquid were in that particular orientation, then there could be no other explanation than it being poison and not saliva. He also reasoned that scorpions, ants, and bees also used this method to injure: in all three, being stabbed by a pointy appendage was followed by the intrusion of some sort of liquid. It was that liquid, not the wound itself, that was so painful.[144] In the end, he argued that the snake's anatomy made it clear that their main source of poison lay not in a sting in its rattle (as Willem Piso wrote in the 1648 *Historia Naturalis Brasiliae*), or from any sort of charm or power of fascination, but from the liquid contained in sacks in the jaw and delivered to the prey through the greater teeth.[145]

Since his argument centered on physical form, Tyson of course included several images of particularly important structures. As Sachiko Kusukawa argued, the Royal Society used images not just to illustrate, but to shape knowledge itself and advocate for a particular way of doing science.[146] Tyson, who relied on the artistic expertise of Richard Waller, one of the Society's most prolific illustrators, established the importance of

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[143] Tyson, "Anatomy of a Rattle-Snake," p. 48.
[144] Tyson, "Anatomy of a Rattle-Snake," p. 48.
[145] Piso, who wrote the most comprehensive account of rattlesnakes in his book on the history of Brazil, thought that the rattlesnake's rattle functioned like the sting of a bee. Tyson, looking at the size and bluntness of the rattle, wrote "how it can I don't well see," Tyson, "Anatomy of a Rattle-snake," p. 54; Willem Piso and Georg Marcgrave, *Historia Naturalis Brasiliae* (Amsterdam: Elsevier, 1648), p. 274.
[146] Sachiko Kusukawa, "Picturing Knowledge in the Early Royal Society: The Examples of Richard Waller and Henry Hunt," *Notes and Records of the Royal Society* 65 no. 3(2011): 273–294.

anatomy through the images reproduced in his work. For example, when he described the greater teeth, he noted that their shape and size "will be best understood by the Figures we have made of them."[147] Technological limitations meant that the printed version had woodcuts, but the originals were painstakingly sketched in pencil and done over in watercolor.[148] At times, preparing the images was done to the detriment of the anatomy itself. When he described the snake's kidneys, for example, he noted Waller took so long drawing them that the organs dried out before Tyson could had the "opportunity of satisfying [his] curiosity in all respects."[149] He found it a worthwhile trade-off, and wrote that Waller's "curious pencil illustrat[ed] what my Pen was often less able to describe."[150] In Tyson's mind, it was worth abandoning a portion of the anatomy if it would yield a good image, especially since Tyson imagined that his work would be the first in a long succession of Royal Society-sponsored Baconian anatomies of this animal.

Over the course of the late seventeenth century, the Royal Society continued to receive rattlesnakes from abroad. In late 1694, they were given a live rattlesnake with 15 rattles from William Byrd Sr.[151] His son followed in his generous footsteps, and sent several Virginian specimens, including a live rattlesnake and a female opossum which died in 1698 and was anatomized by Tyson.[152] In this craze for cutting things open, it is likely

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[147] Tyson, "Anatomy of a Rattle-snake," p. 46.
[148] The original drawings of this animal and many others are held in the archive of the Royal College of Physicians, MS 618/Tyson.
[149] Tyson, "Anatomy of a Rattle-snake," p. 36.
[150] Tyson, "Anatomy of a Rattle-snake," p. 54.
[151] Dec 12, 1694, Dec 19, 1694, *Journal Book*.
[152] "The Same presented another strange creature called an opossum from the Same place; it had a pouch under its belly, wherein ye young ones entered when ever they were put to it; it was committed to the same person's care," *Journal Book*, July 20, 1697. On this opossum, see Susan Scott Parish, "The Female Opossum and the Nature of the New World," *The William and Mary Quarterly* 54, no. 3 (1997): 475–514.

that Byrd's snake suffered the same posthumous fate.[153] Not all anatomies were done in England. In 1722, Paul Dudley wrote a letter to the Royal Society about some trials he observed on rattlesnakes in New England.[154] He was conflicted, he wrote, about their power of fascination. He experienced some of it for himself, writing that "the eye of this creature has something so singular and terrible, that there is no looking steadfastedly on him; one is apt, almost, to think they are possessed by some Daemon." But while he "dare[ed] not answer for Truth of every Story [he] heard, of their charming," he was nevertheless "abundantly satisfied from many witnesses, both English and Indian, that a Rattlesnake will charm both Squirrels and Birds from a Tree into his mouth."[155] Some of these witnesses were "of undoubted Probity," but he was aware that the standards of proof necessary for matters zoological was not sufficiently given by eyewitnesses of unimpeachable character. So, he offered what he believed to be anatomical proof of this behavior. He wrote that his brother slit open one of these snakes and found two squirrels in its belly, head first. If the snake had caught them by any other method than by charming them, Dudley reasoned, they would not have willingly faced their hunter while they were being swallowed.[156]

Dudley also informed the society that rattlesnakes were viviparous, which he knew from of a series of anatomical observations his friend made. In late May, the unnamed friend captured a handful of snakes as they emerged from hibernation. Over a series of dissections, this person anatomized one snake every few days. In the first snake, he

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[153] See, for example, the snake that James Petiver anatomized for the Royal Society in July 1697, BL MS Sloane 3341, p. 55
[154] *Journal Book*; Paul Dudley, "An Account of the Rattlesnake," *Philosophical Transactions* no. 376 (1722): 292-295.
[155] Dudley, "Account of the Rattlesnake," pp. 292-3.
[156] Dudley, "Account of the Rattlesnake," p. 294.

observed a dozen globules the color of egg yolks in what he took to be the snake's uterus. A few days later, in another snake, the globules appeared larger and had a white speck in them. His next anatomy unveiled clearly defined snakes inside of the globules. Many days and dead snakes later, he killed and opened a final snake, and live baby snakes poured out of its slit body.[157] When Dudley gave the Royal Society information, integral to the account was the reason *why* it was worthy of being believed. The snake's power of fascination was something that he had personally experienced, but that in and of itself was not enough to corroborate his explanation. Instead, it was anatomical evidence that was indisputable. He gave no information about the social status of the person who anatomized so many pregnant snakes because the claim to credibility was in his method more than his status. All of these "men of undoubted Probity," as Dudley described his sources who only recounted colubrine behavior they had seen, could not speak as knowledgeably about animals as an anatomist could because all the probity in the world could not replace actually probing beneath the surface of the skin to reveal the mysteries of the animals they studied.

Information not corroborated by anatomical evidence was immediately suspect, as we can see in another paper delivered to the Royal Society. Its author, named only as Captain Walduck, had long informed learned men in England about the natural, political, and ethnographic history of Barbados.[158] After learning of his desire to correspond with the Society, the apothecary James Petiver was quick to strike up an epistolary conversation. Petiver was especially hopeful that Walduck might send "a few Trifles or rather Curiosities […] that are the productions of Nature, wch you had picked up in your

[157] Dudley, "Account of the Rattlesnake," p. 294.
[158] On Walduck, see Stearns, *Science in the British Colonies of America,* pp. 351-354.

perambulations," and lest there by any doubt about exactly what the society wanted from him, Petiver also sent him a butterfly net.[159] Walduck did disappoint. In one of his earlier attempts at natural history he presented the Society with a paper on rattlesnakes where he described "as many of its Qualities as [he could], leaving a description of its parts to Surgeons and Anatomists." When this paper was read before the Society in January of 1713, the consensus was that he "seemed to give too much credit to the ill grounded reports of the vulgar," even though he reported experiments he said he performed himself, and which were witnessed by credible gentlemen. As Shapin and Schafer have argued, this had been the way facts were corroborated in the Royal Society of the seventeenth century, but this was no longer suitable for matters of zoology in the early eighteenth century. Finally, because he mentioned rattlesnake eggs, (though Tyson and Dudley had given anatomical evidence that they were viviparous) those in the audience dismissed him as a charlatan.[160]

Walduck was not an uneducated man. As historian R.P. Stearns described him, he was widely, though unsystematically, read. He had a penchant for Baconian philosophy and hoped to contribute to the new science. Nevertheless, Stearns wrote that he "displayed no scientific knowledge beyond that of an interested amateur, and his methods left much to be desired."[161] In tracking the history of early modern animal studies, however, we see that it was largely upon the work of interested amateurs (if they could

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[159] "Petiver to Walduck," BL MS Sloane 3337, p. 135; "Petiver to Walduck," BL MS Sloane 3338, pp. 119-120. On the Society's expectations for people in the colonies to supply them with naturalia, see Parrish, *American Curiosity*, pp. 119-120.
[160] January 12, 1713/4, *Journal Book*; Walduck, "Account of the rattlesnake: 1713/4," BL MS Sloane 3339, pp. 113-116. In fairness to Walduck, modern zoologists classify rattlesnakes as ovoviviparous—they produce eggs which hatch internally so that the young are born alive.
[161] Stearne, *Science in the British Colonies of America,* p. 355.

even be called that in the absence of any professional standards) that earlier work about animals rested. Unfortunately for Walduck, however, he was a few decades too late. When he wrote that he would leave the anatomizing to the anatomists, he betrayed his inability to contribute to the advancement of knowledge, or even practice the new natural history as it was unfolding in his own era. In the English world of scientific practice that Deborah Harkness described, the intellectual as laborer served as a leveler and broke down the barriers to entry into the world of the new science.[162] However, the laboring intellectual also often had skills that, though relatively common, were nevertheless available only to a certain, trained, group of people. This in turn had a shuttering effect on whose testimony was intellectually worthwhile, and whose was not. Waldruck, and anyone like him not willing (or not able) to use anatomy as the basis for their zoological research found themselves increasingly shuttered from the new world of natural history. Dissection, and with it, an emphasis on comparing internal structures rather than describing external ones, would rule natural history in the eighteenth century.

Conclusion: A New Comparative Anatomy

In the evening post on February 24, 1698, Hans Sloane received a hastily scribbled note. "Sir," it read, "Mr Hunt was with me to acquaint me that the Possum is dead." The letter was short and to the point: would Sloane like to attend the dissection scheduled to take place the following morning? And could he assemble, in the meantime, "a little acc^{t} of what Authors have described this Animall?"[163] Tyson, who by no means restricted himself

[162] Harkness, *The Jewel House*.
[163] Tyson to Sloane, Feb. 24, 1697/8, BL, MS Sloane 4037, pp. 29-30.

to cutting up snakes, would perform the dissection.[164] Over the course of his lifetime, he published anatomical accounts of the rattlesnake, as well as of a female porpoise, a tapeworm, a roundworm, a jointed worm, a peccary, a male and a female opossum, and a juvenile chimpanzee. However, he dissected far more than he published, and his works are full of references to the anatomical makeup of things as varied as crocodiles, bullfrogs, and ostriches, as well as the more prosaic cats and dogs.[165] He also intended to publish more than he did—there exist, for example, a set of images that show the progressive exploration of an ostrich which never appeared in print.[166] **[Figure 5.7 and 5.8]** Tyson believed that anatomy was "the most principal part in a Natural History," and comparative anatomy was the basis upon which the history of animals ought to be written.[167] Programs to systematically anatomize animals were not unique to the Royal Society, however. The French Royal Academy of Science also spearheaded a similar project to anatomize the animals that passed through Louis XIV's menageries.[168]

Why exotic animals? Their inherent spectacularity commanded attention.[169] Moulin, Blair, and Tyson all justified their work by arguing that the learned public was curious about unusual animals like the ones they dissected, thus they would be interested in reading an account of them. They also wanted to gain a place in the Royal Society and saw

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[164] He performed most of the Royal Society's dissections, see "Dr. Tyson's *Praelectiones medicae*," BL MS Sloane 2770.
[165] On Tyson, see Cole, *A History of Comparative Anatomy* pp. 198-221; Ashley Montagu, *Edward Tyson, M. D., F. R. S., 1650-1708, and the Rise of Human and Comparative Anatomy in England; A Study in the History of Science* (Philadelphia: The American Philosophical Society, 1943).
[166] Royal College of Physicians, MS 618/Tyson contains scores of sketches, watercolors, and notes from his anatomical (and to a smaller degree, medical) work.
[167] Quote from Tyson, "Account of a Rattlesnake," p. 26. The sentiment also appears in Tyson, "Carigueya, seu Marsupiale Americanum," *Philosophical Transactions* 20, no. 239 (1698), p. 159; "Account of a Rattlesnake," p. 29.
[168] Sahlins, *Year of the Animal*, pp. 163-198; Anita Guerrini, *The Courtiers' Anatomists: Animals and Humans in Louis XIV's Paris* (Chicago: University of Chicago Press, 2015).
[169] Findlen, *Possessing Nature,* p. 221.



Figure 5.7: Patrick Blair/Walker [?], Ostrich muscles, Royal College of Physicians, MS 618



Figure 5.8: Patrick Blair/Walker [?], Ostrich viscera, Royal College of Physicians, MS 618

anatomy as their ticket of admission. So, just as courtly practice shaped Galileo's science, they fashioned their works to fit the already established program of the Society.[170] Thus, they translated the instruments and terminology of the new science into the more traditionally encyclopedic one of natural history. As a result, they used (or lamented the lack of) new instruments like microscopes.[171] They paid increasing attention to the things that could be counted, measured, quantified, and visualized, and they stressed the importance of the replication of observations, and in trusting the evidence of one's own senses over that of the printed word. Publishing in turn codified these practices, and the institutional structure of the Royal Society also reinforced and schematized investigation, and its own members worked to continue to validate certain kinds of knowledge over others.

Descriptive anatomy was of course not new—it had been reasserted as centrally important to human medicine since the sixteenth century. What had changed, however, was the *importance* anatomy had in the subset of natural history that dealt with animals. For people who studied animals, it was no longer sufficient to merely describe their exterior shapes, the sounds they made, their habitat, or what they tasted like. It was also not enough to cite personal experience or even the testimony of gentlemen of unimpeachable character to establish the credibility of an account. Instead, it was necessary to confirm information by anatomical means. Let us return for a moment to Belon and the sixteenth century. In his *Histoire Naturelle des Estranges Poissons Marins*

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[170] Mario Biagioli, *Galileo Courtier: The Practice of Science in the Culture of Absolutism* (Chicago: University of Chicago Press, 1993).
[171] On Tyson's use of the microscope to aid in dissection, see Edward Tyson, *"Lumbricus latus*, or a discourse read before the Royal Society of the joynted worm," *Philosophical Transactions,* no. 146 (1683), p. 128.

(1551), he described some very strange fishes that were uncannily similar to mammals on their insides. They were viviparous, gave suck to their young, and had a totally different internal structure than normal fish. Yet tellingly, he still considered them to be fishes, albeit strange ones, because he and other sixteenth century naturalists placed a greater importance on external characteristics (that they swam in the sea) than internal structures.[172] What we see with the anatomists at the end of the early modern period is a drastic reorientation of what was essential about an animal.

Tyson's anatomies in particular were a culmination of this reorientation. He argued for the importance not only of dissection, but of the systematic anatomization of all animals. This, he thought, should be the basis of a new kind of natural history, one that used new methods to work towards different goals. While this chapter has focused on the Royal Society, the Académie des Sciences was also similarly interested in animal anatomy, and routinely dissected naturalia they received through their own colonial networks, though the English work was more widely read and ultimately more influential than its French counterpart.[173] Historians of science have long argued that the late seventeenth century saw a rise in a new experimental method that provided the justification for matters of fact, especially in the physical sciences.[174] These changes, however, also extended into

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[172] This understanding of whales persisted into the nineteenth century, see D. Graham Burnett, *Trying Leviathan: The Nineteenth-Century New York Court Case That Put the Whale on Trial and Challenged the Order of Nature* (Princeton: Princeton University Press, 2010).
[173]See, for example, Claude Perrault, *Mémoires pour Servir à l'Histoire Naturelle des Animaux* (Paris: Imprimerie Royale, 1671) published by the Académie des Sciences. For a discussion of how Tyson was explicitly aligning himself and his program against what he saw as the more anonymous and closed way of doing science that the French advocated, see Noah Moxham, "Edward Tyson's *Phocaena*: a case study in the institutional context of scientific publishing," *Notes and Records* 66, no. 3 (2012): 235-252. See also Sahlins *1668: The Year of the Animal in France*.
[174] Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: University of Chicago Press, 1994). Peter Dear argues that the death knell for Aristotelianism was the rise of detailed accounts about specifics and fall of generalities about the

natural history, and the same era also saw the rise of a fundamentally new approach to the study of natural history, particularly of animals.

Perhaps the best illustration of this new turn can be found in Tyson's unpublished manuscripts. **[Figure 5.9]** In preparation for a work about ostriches, he had his artist (likely Walker) create a series of images of a dissection in progress.[175] In one watercolor, the viscera of a dissected animal lay draped over a book. The text is a nod to the bookish past of natural history which relied heavily on textual exegesis. But, looking closely at the spine, we see that the book was not one traditionally associated with natural history. Instead, it was titled *Anatomia Animalium*. This most modern of books, however, remained closed. Rather than peering at the pages, the viewer's eye could only examine the inside of the ostrich's body. The two hundred years that preceded this illustration were ones that brought great change to how Europeans studied animals, and this image makes it clear where authority rested—not in a specimen perfectly stuffed for display in a cabinet, and not in a text, no matter how modern. Instead, authority about animal bodies came from the act of dissection in the body itself. In this transformation of the influence of text, one could not even open the book of anatomy without dealing with the sectioned body itself.

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usual course of things, Peter Dear, *Revolutionizing the Sciences: European Knowledge and its Ambitions, 1500–1700* (Princeton: Princeton University Press, 2009).

[175] These illustrations are similar to (and perhaps an homage to) the images in Vesalius's *De Fabria*, which show a progressively dissected human body from the skin to the bones. For the images, see Royal College of Physicians, MS 618. My thanks to Jenny Hazelhurst for identifying the animal in question as an ostrich.

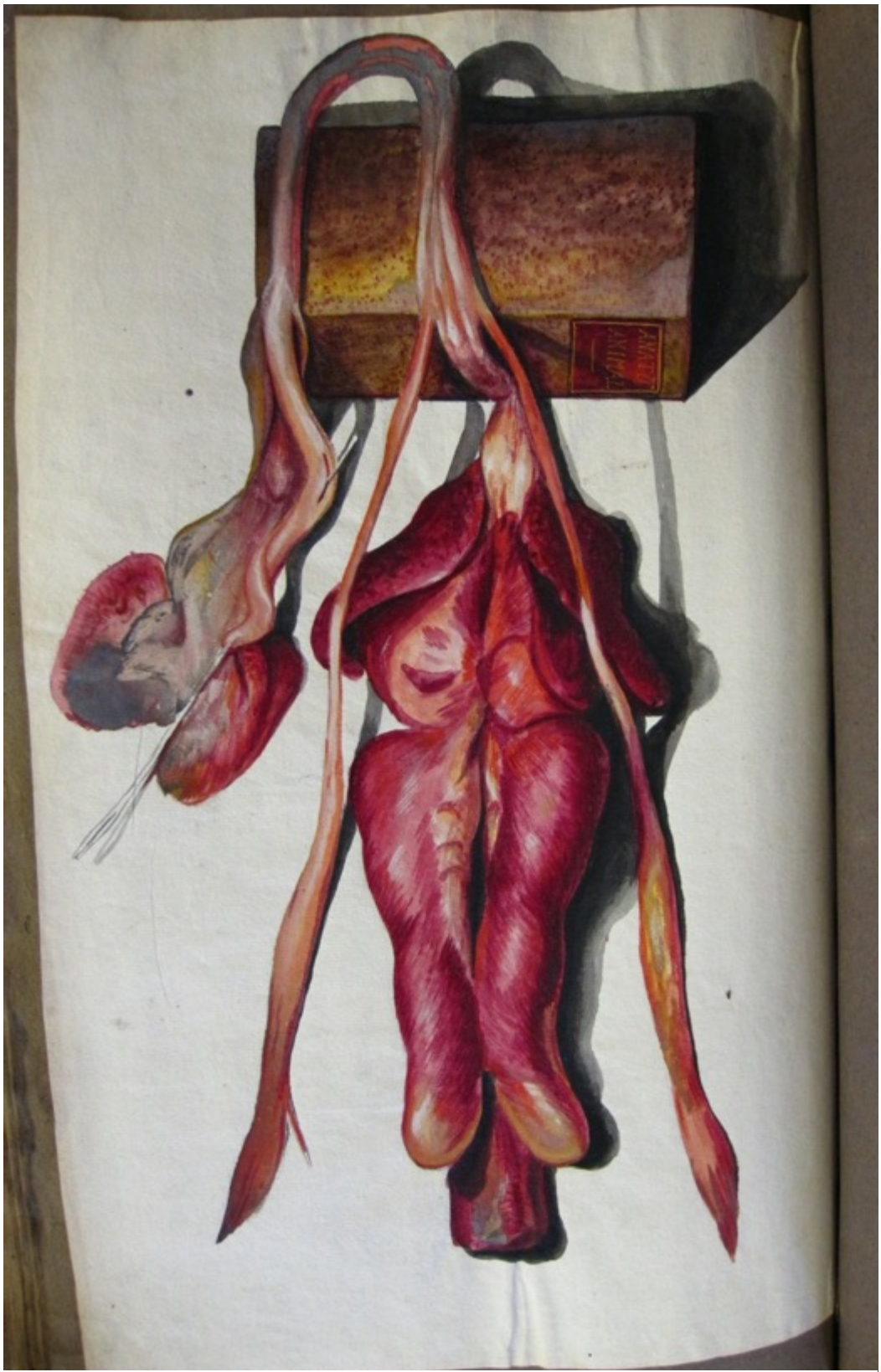

Figure 5.9: Patrick Blair/Walker [?], Ostrich and book, Royal College of Physicians, MS 618

CONCLUSION: THE FABULOUS FOUND

In a nineteenth-century textbook on zoology, the British naturalist and scientific popularizer Philip Henry Gosse wrote somewhat disparagingly of his early modern predecessors. Describing the basilisk, he noted that:

> The worthy Aldrovandus has favoured us with a veritable engraving of [this] royal reptile, with eight feet, a long and hooked beak, and a *crown* upon its head! It was said to have the power of striking its victims dead at a glance, and to chase all other animals from its regal residence by the tones of its voice. To add to its marvelous reputation, it proceeded from an egg, forsooth, of a *cock*!

But Gosse was no dummy. "Of course," he assured his readers, "there is no more connection between this fabled animal and the Saurian we are about to describe, than between the Dragon of ancient fable and the little winged reptile of Java."[1] Aldrovandi's so-called basilisk, he argued, was the *B. mitratus* named by François Marie Daudin in 1802.[2] Gosse noted that this was a common strategy: "Naturalists have, as in the case of the basilisk, chosen to avail themselves of a well-known name, and to apply it to a real animal, which had been previously unknown."[3] Gosse made this process sound simple: early modern naturalists found animals which were unknown (at least to them) and gave them names of fantastical or mythical creatures, thus solving the problem of identification and naming in one fell swoop. Unknown animals were no longer unknown, and the

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[1] Philip Henry Gosse, *An Introduction to Zoology*, volume 2 (London: Printed for the Society for Promoting Christian Knowledge, 1844), p. 33, emphasis in the original.
[2] François Marie Daudin, *Histoire Naturelle, Génerale, et Particulière des Reptiles*, volume 3 (Paris: F. Dufart, 1802), p. 301.
[3] Gosse, *Introduction to Zoology*, p. 33. Gosse was obviously not the only naturalist to think so. When he described *B. mitratus,* Daudin made the same point.

mythical creatures in which early modern Europeans wholeheartedly believed were finally located. If that location was somewhere far from Europe, all the better.[4]

In some respects, this does seem to be the case. To take some examples from earlier chapters, we see quite a few fabulous creatures. In, for example, a description of the 1499 Spanish expedition to Cabo de la Vela in Theodore de Bry's *Americae*, the author described how Europeans came across "horrible snakes with feet and wings," which, in the accompanying engraving, were clearly depicted as semi-domesticated dragons.[5] **[Figure 2.3]** This is the same process that conjured mermaids in the waters off the coast of California, as in the 1533 rutter described in chapter 1. **[Figures 1.1 and 1.3]** However, it is incorrect to assume that these identifications were unfortunate slippages that would be rectified by later naturalists who, unlike their credulous predecessors, were not so naïve as to believe that basilisks, dragons, and mermaids existed, much less roamed free on the American continent. In the early modern period, belief in fabulous animals was not a symptom of pre-modernity's ignorance, an ignorance that would be righted at some point along humankind's inexorable trudge towards some sort of objective truth about the natural world. Rather, if we look at the history of what we might anachronistically call zoology, we see that the lines between myth and reality, fact and fiction, imaginary and real were not so much blurred as they were nonexistent, and these animals existed in a liminal space that proved quite fruitful for early modern investigators of the natural world.

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[4] Paula Findlen, "Jokes of Nature and Jokes of Knowledge: The Playfulness of Scientific Discourse in Early Modern Europe," *Renaissance Quarterly* 43, no. 2 (1990):292-331; Lorraine Daston and Katharine Park, *Wonders and the Order of Nature, 1150-1750* (New York: Zone Books, 2001).

[5] Johann Theodor de Bry, *Americae Pars Decima* (Oppenheimii: Typis Hieronymi Galleri, 1619), engraving 4, f. bi^{r}.

By way of conclusion, let us turn to an animal that permeated European consciousness—the unicorn—and the status Europeans afforded it over the years. The first unicorn story likely came from Asia some 4000 years ago. Stories about this creature passed to Greek naturalists who described wild asses in India as having white bodies, purple heads, blue eyes, and a pure white horn with a black tip that was imbued with protective powers.[6] This animal made it into the definitive work about nature in the Roman world, Pliny's *Natural History*, which described a horse-like animal with "a single black horn, which projects from the middle of its forehead, two cubits in length."[7] Six hundred years later, little had changed in unicorn lore. In his *Etymologies*, Isidore of Seville's unicorn was remarkably like Pliny's, though Isidore also noted that some called it a rhinoceros.[8] He did not distinguish between the descriptions of the animal in Pliny or that in the didactic *Physiologus,* a second century work of Christian morality that imbued the natural world with symbolic qualities and was the precursor to the medieval bestiary.[9] In the bestiary tradition, unicorns were allegories of Jesus, where the animal's fierceness was akin to Christ's in his resolve against the devil that tempted him in the desert and whose single horn represented the unity of God and his Son.

By the sixteenth century, unicorns were facts of life, and they had a place alongside the cats, cattle, and chameleons of that era's zoology. People knew what they were, and what they looked like. In fact, they were more well-known than plenty of other animals that did not live on the European continent. In Job 39, for example, God asked Job a

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[6] Kelly Enright, *Rhinoceros* (London: Reaktion Books, 2008), chapter 1.
[7] Pliny the Elder, *Natural History*, vol. III (Cambridge, MA: Harvard University Press, 1983), 8:31.
[8] Isidore of Seville, *The Etymologies of Isidore of Seville*, Stephen A. Barney, ed. (New York: Cambridge University Press, 2006), p. 252.
[9] Michael J. Curley, ed., *Physiologus* (Chicago: University of Chicago Press, 2009), pp. 51-52.

series of rhetorical questions about His creation, and in doing so, discusses the strength of the unicorn and the foolishness of the ostrich.[10] A sixteenth century illustration of this passage suggests what a contemporary reader might have understood by these animals. **[Figure 6.1]** The animal hooked to a plow is clearly an equine-looking unicorn, a familiar enough creature for the illustrator. The ostriches, however, proved to be more problematic, suggesting that although the latter was the only ostensibly 'real' animal of the two, for the illustrator, the unicorn was the far more familiar figure.



Figure 6.1: Unicorn and Ostriches, Bodleian Library MS. Laud Gr. 86

[10] "Canst thou bind the unicorn with his band in the furrow? […] Gavest thou the goodly wings unto the peacocks? or wings and feathers unto the ostrich? Which leaveth her eggs in the earth, and warmeth them in dust?," Job 39:10-14 (KJV); in the Vulgate, the text reads *rinocerous*.

Moreover, it would have been difficult, even impossible, for people in the early modern period to doubt something whose presence could so unequivocally be proven because it left such real traces of its existence. Powdered unicorn horn could be found for sale in any high-end apothecary in Europe, even if it did cost, as Thomas Dekker wrote in 1609, "half a city."[11] It was a mainstay in early modern pharmacopeia. Dipped into a drink, it rendered even the strongest poison harmless, and powdered, it protected against plague, the falling sickness, and bites of mad dogs.[12] They were also mainstays of cathedral, and later, private collections. The Church of Saint Mary in Utrecht had three unicorn horns, which they brought out on feast days. Saint-Denis in Paris owned a horn that supposedly was a gift from Harun al-Rashid to Charlemagne, and San Marco in Venice was said to have one that was a gift from Süleyman the Magnificent.[13] These items by and large originated from a conveniently far-away place, in these cases, the Near East, which explained why plenty of horns made it to Europe though actual animals did not.

Yet, starting in the seventeenth century, Europeans were beginning to have their doubts. There had always been chatter that the unicorn was just an African rhinoceros, an animal that, after all, had one horn, but was nowhere near as graceful as the stories suggested. The sixteenth century's most famous image of this animal suggests as much. The first elephant to reach Europe since antiquity came in the form of a 1515 re-gift from Portugal's Emanuel I to Pope Leo X.[14] Though he had not seen it in person, Albrecht

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[11] Thomas Dekker, *The Guls Horne-Booke* (London: [Nicholas Okes] 1609).
[12] See, for example, the recipe in D. D., *The Skilful Physician: Containing Directions for the Preservation of a Healthful Condition, and Approved Remedies for All Diseases* (London: Tho. Maxey for Nath. Ekins, 1656), pp. 34-35.
[13] The Saint Mary unicorn horns are now at the Rijksmuseum (NG-NM-2808, NG-NM-2809, NG-NM-2810). See also Daston and Park, *Wonders and the Order of Nature*, pp. 69, 74-65, 77.
[14] Silvio A. Bedini, *The Pope's Elephant* (New York: Penguin, 2000).

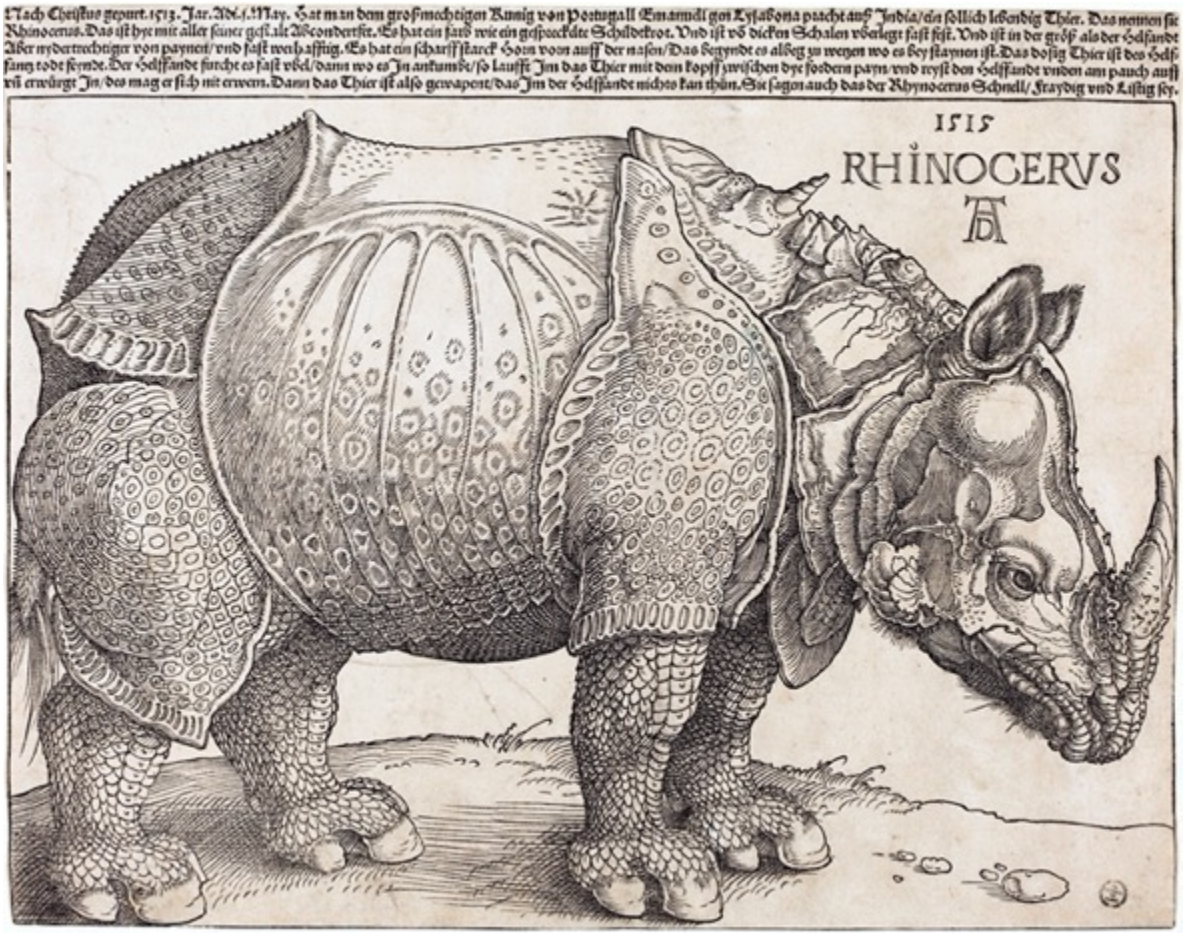

Figure 6.2: Rhinoceros, Albrecht Dürer, 1515

Dürer saw enough sketches of it to execute one of his most well-known engravings. **[Figure 6.2]** The image is a testament to the pull that the mythology of the unicorn had for sixteenth-century Europeans: while there are obvious differences between the graceful unicorn (as it was depicted in the period, at least) and Dürer's armored beast, he nevertheless gave it the characteristic (and completely fictional) spiral horn which was so emblematic of the unicorn.[15]

[15] Donald Frederick Lach, *Asia in the Making of Europe*, vol. 2 (Chicago: University of Chicago Press, 1977), pp. 158-172; F. J. Cole, "The History of Albrecht Dürer's Rhinoceros in Zoological Literature," in *Science, Medicine, and History: Essays on the Evolution of Scientific Thought and Medical*

Others identified the animal with a type of fish common in the North Sea. Olaus Magnus included one in his 1539 *Carta Marina*, though it is unclear whether he believed the unicorn to be a sea animal, or if, much like his sea pig or sea cow, he took to heart Pliny's dictum that all terrestrial animals had pelagic counterparts.[16] **[Figure 6.3]** Edward Lloyd, keeper of the Ashmolean Museum in Oxford, had more serious doubts. As he recounted in a letter to the naturalist John Ray, in 1690 he visited the collection of



Figure 6.3: Olaus Magnus, Carta Marina, 1539

Practice Written in Honour of Charles Singer, E. Ashwood Underwood, ed. (London: Oxford University Press, 1953).

[16] Joseph Nigg, *Sea Monsters: A Voyage around the World's Most Beguiling Map* (Chicago: The University of Chicago Press, 2013); Chet Van Duzer, *Sea Monsters on Medieval and Renaissance Maps* (London: The British Library, 2014).

William Cole, where he was shown "the horn of a Narhual, curiously wreathed, and about five feet long." He then told Ray that "A Danish gentleman told me he had seen [one] that had been taken by some Hamburgers at Greenland in 1684, having two very long horns." This two-horned variety, then, was the norm, and "the Unicorns of them are but monsters."[17] So, for Lloyd, the mythical unicorn still existed, though as a small subset of a type of fish that normally had two horns, as symmetry required.

So, what can we make of this? We might be tempted to think that this is a straightforward story: At one point, Europeans organized their animals into bestiaries, where their importance lay in the allegorical stories they provided. Early modern audiences were concerned with the deeper symbolism and supposed moral character of animals, and neither their physical characteristics nor their ontic states loomed large in natural history. Then, when Europeans began to explore more and more of the globe, they encountered all sorts of new creatures, which was problematic. Even more troubling, they slowly began to realize that the animals they had assumed to be real, albeit rare, in fact did *not* exist, and they belonged, to borrow a phrase coined several hundred years later, in the dust heap of history. This version of the story conforms with what the historian William Ashworth has signaled out as the turning point for modern natural history: the publication of the 1646 *History of Brazil* by Willem Piso and George Marcgraf.[18] For Ashworth, this book served as a wall separating the superstitious from the resolutely modern. He argued that the *History of Brazil* marked the advent of what he called "objective description," and a

[17] Edward Lhwyd to John Ray, Oxford, 1 July 1690, in John Ray, *The Correspondence of John Ray*, Edwin Lankester, ed. (New York: Arno Press, 1975), pp. 224-226.
[18] William B. Ashworth, Jr., "Remarkable Humans and Singular Beasts," in *The Age of the Marvelous*, Joy Kenseth, ed. (Hanover, NH: Hood Museum of Art, Dartmouth College, 1991), pp. 113-144.

turn away from "the myth-laden accounts of Aldrovandi and Gessner." Now that people had done away with ridiculous legends, natural history was now modern.

This narrative, however, does not reflect the complexities of early modern studies on animals. The unicorn (and its myth) still existed for Edward Lloyd in 1690. It wasn't the same unicorn as Pliny's, but it was still a unicorn. There is no fascicle demarcation, no one point in history where we can say that, here, past this line we became modern, and before that, we were still in the thrall of superstition, clinging to archaic myths, and taking hearsay as truth. The myth of the unicorn was never destroyed; it was simply rewritten. In 1749, Gottfried Leibniz's *Protogaea* was published posthumously, and it contained a depiction of a unicorn fossil.[19] As late as the nineteenth century, serious, sober-minded naturalists debated the existence of the "true" unicorn in the pages of the *Philosophical Transactions* after a sighting of one in Lattakoo (in modern-day South Africa).[20] The same impulses that Gosse decried as the particular folly of Aldrovandi and his ilk were still alive and well in the nineteenth century. Yet, natural history done in the early 1500s was quite different from what was done in the 1800s.

As this dissertation has shown, how Europeans understood animals changed dramatically from the start of the sixteenth century to the end of the seventeenth, but as the above example of the unicorn shows, this process was neither linear nor neat. In the sixteenth century, as Europeans began to travel farther from their homes, they

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[19] Gottfried Wilhelm Leibniz, *Protogaea*, Claudine Cohen and Andre Wakefield, eds. and trans. (Chicago: University of Chicago Press, 2010).
[20] "Discovery of the Unicorn in Africa," in *The Asiatic Journal and Monthly Register for British India and its Dependencies*, July 1821, p. 36; Everard Home, "On a New Species of Rhinoceros Found in the Interior of Africa, the Skull of Which Bears a Close Resemblance to That Found in a Fossil State in Siberia and Other Countries," in *Philosophical Transactions of the Royal Society of London,* 112 (1822): 38-45; John Campbell, *Travels in South Africa* (London: Black and Parry, 1815), pp. 293-95.

encountered animals that were unknown to them. Some travelers saw them in the flesh, as we saw in chapter 1. As we saw in chapter 2, the vast majority of Europeans, however, experienced American animals from an immense distance, mediated through the words of travel writers who included both written descriptions and illustrations about animals in their published works. Both these groups of people had to grapple with the unfamiliar, and they tried out new strategies for describing autochthonous American animals in a way that would not only make them legible to audiences in Europe, but also allow them to exist within prevailing understandings of the natural world. As these two chapters show, these strategies were, by and large, not successful. When travelers tried to explain uniquely American animals as one-off chimeras or monsters, nature disappointed them by revealing more and more identical examples of these supposed monsters. As more travelers went to the American continent and wrote about such incongruous things as opossums and armadillos, it became clear that these animals were part of the normal order of nature.

In order to make sense of these animals, and in an attempt to place them into a European knowledge system, several people embarked on a systematizing project and began to write works of natural histories that included American animals. As we saw in chapter three, some of these projects were done by Spaniards residing in Spanish America, and their models came straight out of classical antiquity, though their content did not. The two case studies presented in that chapter were not solely works of natural history, however. Because they were ultimately done for imperial (in the case of Oviedo) and ecclesiastical (in the case of Acosta) purposes, they only included the parts of the American continent under Spanish control. As a result, their descriptions of animals were not exhaustive, and neither were their texts exclusively dedicated to animals. This was, of

course, not unusual. The definition of natural history was expansive for those that looked to classical antiquity for their models.

On the European continent, others were experimenting with natural history in a different context. Scholars in Europe did not always have the opportunity (or the inclination) to travel to faraway locales to gather information from the source. Chapter 4 looked at European authors of encyclopedias of natural history—naturalists who attempted to write a history of animals that included all the known animals of the world. Writing works that included everything from African asps to American ungulates, however, proved to be a difficult task. As they began to organize their encyclopedias, these authors ran into classificatory problems—where should New World animals fit into their catalogs? Similar problems plagued collectors who assembled *Wunderkammern* that purported to house the entire world within the confines of one cabinet. European classificatory schemes and criteria were built on animals that had been known to Europeans for centuries, but some New World creatures did not easily fit within these categories. Moreover, they confounded not only the categories, but the criteria for categorization. The solution to these problems of categorization came by changing the criteria for analysis. Focusing on external characteristics and behavior to classify animals had not proved fruitful for early modern European naturalists. Chapter 5 traced how a group of people working within the Royal Society began a new program for studying animals. Rather than focusing on external characteristics, these people turned to dissection and anatomy to study—and classify—animals. Moreover, as this chapter shows, these new strategies were used for New and Old World animals alike, illustrating that comparative anatomy was used to make sense of all animals, not just those with which Europeans were

less familiar, laying the foundation for the classificatory projects of the eighteenth and nineteenth centuries.

Over these five chapters, this work argued for a need to expand the historiography of early modern natural history to include animals, it positioned the rise of comparative anatomy within the problems raised by New World animals, and it showed the interconnectedness between learned and lay observers in the creation of natural knowledge**.** It is undeniable that botany played a larger role in European life than what we might call proto-zoology. Plants were economic drivers and important medicines, and as a result, they played a much larger role in European life. Also, botany was formalized as a discipline in the early modern period in a way that zoology was not. Nevertheless, the way that Europeans understood the animals of the New World played a distinct role in the creation of new forms of natural knowledge in Europe. Examining how European travelers attempted to understand new animals sheds light on the epistemological practices of early modern Europeans and shows how existing structures of knowledge can break down. The recalcitrance of American animals to fit neatly within European categories forced a reorganization of what it meant to understand an animal. Since too many American animals had behaviors and outward appearances that did not fit neatly within categories that had not been written with them in mind, Europeans found themselves rewriting what characteristics were most essential about an animal. Rather than their outward appearances, what became salient was how their internal structures compared with other animals. Comparative anatomy, in turn, would become the darling of eighteenth and nineteenth century natural history.

The historiography of the classification of the natural world tends to favor the eighteenth century and the work of systematizers like Carolus Linnaeus and Georges

Louis Leclerc, Comte de Buffon. If one only reads Linnaeus himself, it is understandable to conclude that classification was an eighteenth-century phenomenon. In his 1735 *Systema naturae,* he wrote that "the first step in wisdom is to know the things themselves […] Objects are distinguished and known by classifying them methodically and giving them appropriate names. Therefore, classification and name giving will be the foundation of our science."[21] Though best known for his sexual system of plant classification, he applied his remarks to all of natural history, not just botany. However, as this dissertation has shown, questions of classification (and naming) were very much at the forefront of early modern natural history. Linnaeus took it as a matter of course that one should dissect creatures before cataloging them in a larger system of nature, but that act was by no means a foregone conclusion. In the sixteenth century, it would have seemed to be madness to use an animal's interior to classify an animal, since the interior revealed nothing of importance.[22] This shift was very much rooted in the specific problems that New World animals posed for those who tried to make a coherent classification of animals in the early modern period.

This dissertation has also argued that this reconfiguration of structures of knowledge was not exclusively the purview of learned naturalists. Both learned and lay observers were crucial actors in this process. Doing natural history in this era—be it filling out rutters for the Spanish bureaucratic state or writing encyclopedias of natural history for a learned audience—was dependent on the expertise and experience of people who may not have been highly literate or traditionally learned, but who nevertheless could and

[21] Carolus Linnaeus, *Systema naturae: Facsimile of the First Edition* (Leiden: Brill, 1964), p. 19.
[22] See chapter 4 of this dissertation.

did contribute not only to the creation of new knowledge, but also to the development of a new way of doing natural history.

More work still needs to be done, however, to recognize what Marcy Norton and Ralph Bauer have called an "entangled histor[y] of the Early Modern Atlantic world" that includes the perspectives of subaltern actors.[23] As Norton has argued, an entangled history has the possibility of showing the "permeability, rather than only incommensurability, in the encounter between different ontologies, epistemologies, and other cultural systems."[24] European travelers to the New World encountered people for whom indigenous American animals were neither new nor strange, and animals played (and continue to play) an important role in Mesoamerican folklore and religion.[25] An entangled history would bring to light the important ways that subaltern people were knowledge producers, and show how their information, perspectives, and experience were incorporated within European thought.[26]

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[23] Ralph Bauer and Marcy Norton, "Introduction: Entangled Trajectories: Indigenous and European Histories," *Colonial Latin American Review* 26, no. 1 (2017):1-17, p. 2.
[24] Marcy Norton, "Subaltern Technologies and Early Modernity in the Atlantic World," *Colonial Latin American Review* 26, no. 1 (2017):18-38, p. 18
[25] Much of this work has been done in the context of anthropology or ethnography, see for example Franke J. Neumann, "The Dragon and the God: Two Symbols of Time in Nahuatl Religion," *Numen* 22, no. 1 (1973): 1-23; Victoria Schlesinger, Carlos Galindo Leal, and Juan C. Chab-Medina, *Animals and Plants of the Ancient Maya: A Guide* (Austin: University of Texas Press, 2001); Eugene Newton Anderson and Felix Medina Tzuc, *Animals and the Maya in Southeast Mexico* (Tucson: University of Arizona Press, 2005); Alfredo López Austin, *Los Mitos del Tlacuache: Caminos de la Mitología Mesoamericana* (Mexico City: Universidad Nacional Autónoma de México, 2006). For maize, see Nicholas A. Hopkins, "The Place of Maize in Indigenous Mesoamerican Folk Technologies," in *Histories of Maize in Mesoamerica: Multidisciplinary Approaches*, John Staller, Robert Tykot, and Bruce Benz, eds. (Oxford and New York: Routledge, 2010), pp. 223-234; Janis B. Alcorn, Barbara Edmonson, and Cándido Hernández Vidales, "*Thipaak* and the Origins of Maize in Northern Mesoamerica," in *Histories of Maize in Mesoamerica: Multidisciplinary Approaches,* John Staller, Robert Tykot, and Bruce Benz, eds. (Oxford and New York: Routledge, 2010), pp. 190-200.
[26] Marcy Norton has done this with the concept of the *iegue* as the origin for the modern notion of a pet, "The Chicken or the *iegue*: Human-Animal Relationships and the Columbian Exchange," *The American Historical Review* 120, no. 1 (2015): 28–60.

Colonial sources can and should be read against the grain to uncover more subaltern voices and trace where and how Amerindian knowledge was brought into European worldviews.[27] That this process occurred is not in doubt, even if Europeans intentionally minimized Amerindian agency and knowledge. As we saw in chapter 3, both Oviedo and Acosta noted (with varying degrees of hostility) points where they were relating what they learned from indigenous people, though they never explicitly name any one source. As we saw in chapter 4, Bernardino de Sahagún also documented Aztec beliefs, culture, and history with the help of indigenous students at the Colegio de Santa Cruz de Tlatelolco. Their work forms one of the richest sources of extant Aztec animal lore. Similarly, the unidentified translator of Aesop's fables into Nahuatl (chapter 4) also recorded Amerindian understandings of animals when they swapped in American animals and tweaked the morality tales to better agree with Mesoamerican folklore.

Indigenous ideas were clearly known and knowable to Europeans. The best example of this is in the names of these creatures themselves. Modern European languages talk about iguanas, capybaras, opossums, tatous, jaguars, tapirs, manatees, and other animals. All these names are loan words from various indigenous languages and reveal (if in a bowdlerized form) their original names. In a recent push to re-center indigenous names in modern scientific taxonomy, Len Gillman and Shane Wright argue that in many cases, the names indigenous people gave to plants and animals can be "knowledge conduits" and "conve[y] in-depth knowledge relating to form, usage, distribution, and

[27] On reading the silences in the historical record, see Londa Schiebinger, "Agnotology and Exotic Abortifacients: The Cultural Production of Ignorance in the Eighteenth-Century Atlantic World," *Proceedings of the American Philosophical Society* 149, no. 3 (2005): 316–43.

ecology."[28] Though these associations may not be legible for many Western people, for indigenous people, names in their vernacular forms reveal something of the power of these natural things. Gillman and Wright note that some taxonomists are working with indigenous peoples to propose names for newly assigned taxa, but they argue that the International Code of Nomenclature for algae, fungi, and plants (ICN) and the International Commission on Zoological Nomenclature (ICZN) should change their rules to allow for retroactive name changes that promote pre-existing indigenous names, if there is a name that covers the whole distribution of that species. Moreover, the authors argue that these changes comport with the both the ICN and the ICZN's own rules, which are based on priority. The most recent edition of the ICZN states that the "valid name of a taxon is the oldest available name applied to it."[29] The biases of Eurocentrism meant that for centuries, scientists overlooked the most basic fact that the oldest names for the natural things of much of the global south were not those given to them by colonizers, but the names that indigenous people had already given them. As this example shows, the work of natural history is never done. Much like their early modern counterparts, modern biologists are still trying to understand the natural world. Also like their predecessors, new ways of looking at the world could end up toppling a way of doing natural history that had existed for centuries.

[28] Len Norman Gillman and Shane Donald Wright, "Restoring Indigenous Names in Taxonomy," *Communications Biology* 609, no. 3 (2020): 609.
[29] Quoted in Gillman and Wright, "Restoring Indigenous Names," p. 609.

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- Biblioteca Real
- Real Academia de Historia

The Netherlands:
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