

Nautical Rutters and New Bodies of Knowledge in the Age of the
First Globalization, 1400–1600

Maritime Humanities, 1400-1800

Early modern oceans not only provided temperate climates, resources, and opportunities for commercial exchange, they also played a central role in cultural life. Increased exploration, travel, and trade, marked this period of history, and early modern seascapes were cultural spaces and contact zones, where connections and circulations occurred outside established centres of control and the dictates of individual national histories. Likewise, coastlines, rivers, and ports were all key sites for commercial and cultural exchange.

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Nautical Rutters and New Bodies of Knowledge in the Age of the First Globalization, 1400–1600

Edited by
Luís Campos Ribeiro
David Salomoni
Henrique Leitão

Amsterdam University Press

This book was supported by the ERC-funded project RUTTER – Making the Earth Global. The RUTTER project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 Research and Innovation Programme (grant agreement No. 833438).



Cover illustration: Rutter from Lisbon to Goa by João de Castro, Évora, Biblioteca Pública de Évora, CXV/1-24, fol. 59A.

Cover design: Coördesign, Leiden

Lay-out: Crius Group, Hulshout

ISBN 978 90 4857 106 2
e-ISBN 978 90 4857 107 9 (pdf)
e-ISBN 978 90 4857 278 6 (accessible ePub)
DOI 10.5117/9789048571062
NUR 685 | 466



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Introduction

Luís Campos Ribeiro, David Salomoni, Henrique Leitão

The European maritime expansion that began in the fifteenth century was a highly complex historical phenomenon, catalyzing profound changes not only within Europe, but throughout the world. Central to these transformations was the shift from predominantly agrarian, local European kingdoms to vast, global commercial and imperial powers. The establishment of commercial networks and empires of such unprecedented scope critically relied on long-distance sea voyages and control over maritime routes. Indeed, it was control of vast oceanic areas (before the exploration of land and continents) that enabled the formation of Western empires. In the case of the Portuguese imperial project, although land-based fixed points (such as *feitorias*, entrepôts, and military camps) were essential, maritime voyages were still more crucial. As historians have long pointed out, the Portuguese typically installed themselves in preexisting entrepôts; their novel contribution was the maritime route. Other European empires of the period—particularly the Spanish, English, and Dutch—were similarly reliant on stable oceanic commercial routes, even when engaged in the territorial domination of vast swaths of land. The creation and command of sea routes was therefore of paramount importance, and few documents provide greater insight into the technical efforts involved than rutters and ships' logbooks. The need to exercise dominion over the seas presented Europeans with the challenge of confronting nature on an unprecedented spatial scale. Rutters and ships' logbooks lend a singularly immediate view of practitioners' engagement with this new, planetary field of operation.

Rutters, or sailing directions (in Spanish: *derroteros*; in Portuguese: *roteiros*; in French: *routiers*), are technical documents. They contain information necessary for the execution of long-distance sailing and traversing the earth on oceanic voyages. In addition to specific navigational details (distances, courses, latitudes), they store abundant data about the physical and natural conditions of many different parts of the world (geography, currents and

observations of sea water, prevailing winds, meteorological phenomena, local magnetism, animals and plants sighted, etc.). Rutters were among the most indispensable “tools” employed by early modern pilots, together with nautical charts, compasses and instruments, regiments, and astronomical tables. They offer unmediated access to the copious and myriad knowledge that had to be collected to perform protracted voyages with a modicum of safety and efficacy.

Although the origins of both rutters and logbooks can be traced back to much earlier periods, when they were used for coastal and short-range sailing, rutters only became truly vital when Europeans began engaging in oceanic long-distance navigation in the second half of the fifteenth century. This shift in the scale of navigation brought about significant changes in these documents, leading to the creation of the “oceanic rutter.” While coastal rutters, such as periploi and portolans, provided some instructions and information regarding courses, distances between coastal points, coastal geography, soundings, tides, and guidance for entering ports and anchorages, oceanic rutters expanded upon these components considerably. They likewise included information relevant to long-distance travel and the new experience of crossing seas from continent to continent. Indeed, they are the earliest Western documents that bear witness to the stable and regular lived experience of navigating the Earth’s oceans at a planetary level.

Throughout the sixteenth and seventeenth centuries, oceanic rutters and ships’ logbooks were produced in massive quantities by all nations engaged in maritime expansion. For Portugal and Spain, from the end of the fifteenth to the end of the seventeenth century, several hundred rutters are known today, pertaining to voyages in virtually every ocean of the Earth. Although some collections of rutters were printed in the seventeenth and eighteenth centuries—for example, the one included in Manuel de Figueiredo’s *Hydrographia, exame de pilotos* (1614), or in the 1712 edition of Manuel Pimentel’s *Arte de navegar* (1712)—the vast majority are manuscript.

Sixteenth- and seventeenth-century rutters and ships’ logbooks are not, of course, the only records bespeaking the emergence of a form of globalization; early modern cosmography, geography, and cartography all reflect this phenomenon. However, rutters and logbooks are the most direct and, in many cases, the earliest documents associated with this process. Insofar as they are the first documents to systematically record, organize, and analyze technical and scientific data about the Earth on a global scale, their value for historians of science is unparalleled. Across the pages of rutters and logbooks, far-reaching phenomena and global concepts about

the Earth are treated not in abstract or theoretical terms, but on the basis of first-hand observations and lived experience.

The knowledge set down in rutters and logbooks was not confined to the maritime milieu for long: it was eagerly extracted and exploited by authors participating in other genres. European naturalists and geographers were well aware of the information in rutters and logbooks and frequently incorporated it into their works. Similarly, cartographers and chart makers relied on the data contained in these documents. While such textual and graphical productions are undoubtedly important, they are, in terms of their status as sources on the phenomenon of globalization at hand, secondary and derivative.

Along with cartography, rutters became indispensable tools in the creation of an imperial image of the Earth—that is, one that portrayed the vastness of the world as a space to effect control, expansion, and domination. But in contrast to cartography, which has been studied for several decades in relation to this theme, historians have generally overlooked the part played by rutters in shaping the idea of European control over the seas. Rutters are also valuable sources for understanding non-European traditions: they are exceptional references for ancient toponyms, both European and non-European; they provide rich insight into non-European maritime practices; and they serve as unique testimonies to the movement of knowledge across different parts of the world.

Rutters and logbooks are epistemic artifacts that were inserted in a complex system of knowledge production. This system involved 1) the observing, recording, and collecting of information according to specific protocols; 2) the analysis, comparison, and discussion of this information; and 3) the successive improvement of the contents of these texts. As is well known, planning and control were critical in the maritime expansion of the Iberian nations and all other early modern seafaring powers: institutions, legislation, and processes were put in place to manage important flows of information about the natural world. Rutters and logbooks were part of this logistic and administrative infrastructure.

To sum up, the impact of rutters—and, consequently, their historical value—extends far beyond their maritime context and use as navigational aids. Widely copied and circulated, they attest to significant transfers of information among European nations. In the hands of cartographers, rutters influenced the pictorial representation of the world, and contributed to the evolution of the early modern European conceptualization of space. The data contained in these documents was carefully analyzed by crown officials and politicians, merchants and bankers, chroniclers and scholars,

poets and military figures. Surpassing their original function, rutters left an indelible mark on European literature as a whole, reflecting the widespread dissemination of nautical knowledge across various social strata. Compiled in manuscripts and later printed in collections, oceanic rutters became symbols of a shared global knowledge network, reaching sailors aboard and land-based audiences alike—and ultimately molding Europe's perception of the world as interconnected by the oceans.

This book aims to bring to the fore the relevance of rutters, and maritime technical literature more broadly. Rather than attempting to be exhaustive, the chapters that follow endeavor to show the variety of topics and lines of influence induced by this type of document. Most chapters in this volume were developed through activities and collaborations of the ERC Rutter project (ERC AdG 833438). The first two chapters focus on the textual nature and characterization of early modern rutters, logbooks, and nautical guides, highlighting the versatility of this technical genre and its historical evolution. Chapter 3 examines the legal dimension of these technical documents, while the following three chapters explore the diverse uses and profound impact of the information contained in rutters. Chapters 7 and 8 address the non-European context, specifically early modern Indian Ocean navigation. The final chapter documents the influence of rutters and maritime information on literature and culture at large.

In the first chapter, Luana Giurgevich delves into the development and significance of oceanic rutters—a new textual genre that evolved from practical navigational guides into culturally transformative documents during the Iberian maritime expansions of the fifteenth and sixteenth centuries. Initially produced to facilitate safe navigation through specific routes, rutters grew to incorporate collective maritime knowledge, blending navigational, geographic, and cultural insights. This evolution reflected a shift from regional to global understandings of space, as these texts recorded challenges in long-distance navigation and combined technical guidance with experiential insights. By standardizing and formalizing rutter-writing, the Iberian crowns helped establish a professional culture among pilots, cosmographers, and cartographers. This chapter highlights the significant role of rutters in engendering a collective, transnational maritime consciousness that bridged empirical knowledge and imaginative exploration.

In the second chapter, Carmo Lacerda discusses how sixteenth-century nautical treatises heralded the birth of a new technical literary genre dedicated to oceanic navigation, driven by the Iberian empires' need to formalize and disseminate navigational knowledge. Early works, like the

first printed *Nautical Guides*, aimed to simplify astronomical navigation and offered clear, practical instructions, tables, and even the first vernacular version of Sacrobosco's *Treatise on the Sphere*. These guides established a basic structure blending cosmography and practical navigation instructions, making complex topics accessible to pilots with limited formal education. Later treatises, including Francisco Faleiro's *Tratado del esphera* and Pedro de Medina's *Arte de navegar*, expanded this structure, incorporating more sophisticated diagrams, discussions on instruments, and mathematical concepts. As the genre spread across Europe, works like the *Spiegel der Zeevaerdt* and *The Seaman's Secrets* adapted these themes to meet regional navigational needs. Ultimately, these treatises indicate a transition toward standardized navigational knowledge and illustrate the ongoing tension between the theoretical precision advocated by cosmographers and the practical requirements of pilots.

José Maria Moreno Madrid explores in chapter 3 how Iberian empires in the sixteenth century managed the challenges of transoceanic navigation by developing unique legal systems to regulate oceanic routes. This led to the emergence of legal mechanisms to oversee navigational practices, ensuring that vessels adhered to designated routes to protect imperial interests and avoid unauthorized deviations. Iberian authorities issued rutters and comprehensive instructions to fleet captains, often with strict directives and penalties for non-compliance. Detailed records from voyages, such as logbooks and verification documents, were mandated and required signed confirmation from crew members. Moreno Madrid concludes that these regulatory efforts make manifest the Iberian empires' innovative legal mindset, aimed at achieving long-distance control—a hallmark of early modern imperial administration.

In chapter 4, Nuno Vila-Santa's work on Jan Huygen van Linschoten asks how the Dutch navigator contributed to European maritime expansion by publishing Iberian nautical rutters in his *Itinerario* (1596). The *Itinerario*, which detailed crucial oceanic routes, offered Northern European powers access to previously "secret" Portuguese and Spanish navigational information—a turning point in global maritime history. Although he was often labeled a spy, Vila-Santa argues that Van Linschoten more accurately functioned as a cross-cultural broker, acquiring knowledge through trusted positions, such as his work with the archbishop of Goa, rather than covert espionage. The study underscores the importance of nautical rutters in maritime science and in laying the groundwork for both early globalization and the scientific networks prerequisite for the major empires and commercial institutions of the modern world.

Fabiano Bracht traces how the Iberian empires developed into global knowledge societies in the early modern period, driven by oceanic navigation. Bracht suggests that the Iberian empires' distinctive combination of trade networks, multicultural societies, and the sharing of navigational information fostered an unprecedented knowledge-based economy. Nautical rutters, as technical guides containing vital navigational and geographical data, proved themselves to be an essential genre, melding local knowledge with scientific advances in astronomy and cartography. Through the examples of rutters by Pero Magalhães de Gândavo, Gabriel Soares de Sousa, and André Donelha, Bracht illustrates how these documents transcended navigational purposes to encompass economic, political, and cultural information. Rutters facilitated strategic decision-making, knowledge sharing, and economic reproduction in Iberian society, serving diverse groups, from imperial authorities to merchants.

In his chapter “The Problem of Relational Cardinality, the Sixteenth-Century Atlantic, and the Making of the Globe,” Luis Lobo-Guerrero examines the way Iberian maritime expansion in the sixteenth century transformed spatial awareness and governance, generating a global perspective rooted in navigation and oceanic routes. Central to this was the concept of “relational cardinality”—understanding directional orientation not as fixed points but as flexible, context-dependent tools. Escalante de Mendoza's *Itinerario*, a navigational guide for Spanish fleets, exemplifies this blend, emphasizing that mariners' cardinal orientation depended on their position, which adapted as they moved. Ultimately, Lobo-Guerrero shows that early modern mariners cultivated a dynamic spatial understanding, mixing art and science in navigation, and shaping not only global trade routes but also foundational ideas of global space.

Chapter 7 turns to early modern Indian Ocean navigation and considers the balance between practical and theoretical knowledge in the sixteenth-century Arabic nautical tradition. Focusing on renowned navigators like Aḥmad ibn Mājid and Sulaymān al-Mahrī, Juan Acevedo argues that their navigation was both a precise science and an art enriched by cosmological perspectives, unlike the more bureaucratically structured European approach. These pilots combined empirical observation with respect for tradition, integrating technical skill (*ma'rifah*) with theoretical principles (*'ilm*), and viewing experience (*tajribah*) as central to their craft. Their works covered complex topics such as stellar navigation, route mapping, and knowledge transmission, aligning with medieval European concepts like the *artes liberales*, which valued science for its philosophical roots. In contrast to their European counterparts, who were state-sponsored and

instrumentalized within imperial frameworks, Arabic navigators operated independently, with no official patronage or institutional support. Acevedo highlights this autonomy, suggesting it enabled a purer pursuit of “scientific” knowledge.

In chapter 8, Inês Bénard probes the depiction of Indian Ocean pilots in sixteenth-century Portuguese literature, particularly focusing on the exchange of navigational knowledge between Portuguese and Indian Ocean sailors. Bénard uses a range of Portuguese sources—from chronicles and letters to logbooks and technical guides—to analyze how this knowledge circulated. The chapter discusses four main contexts in which Indian Ocean pilots are mentioned: for guidance, with respect to conflict, in connection with non-navigational information, and in passages about instruments and charts. Bénard contends that while Portuguese records reveal a strong reliance on Indian Ocean pilots for expertise, they also express a Christian bias (albeit tempered by respect for the pilots’ maritime skills). The chapter stresses the complexity of intercultural knowledge exchange in the Indian Ocean, underscoring the need for further research into Indian Ocean sources.

In chapter 9, Joana Lima examines how Portuguese literature of the sixteenth century reflects a shift in European perceptions of global space and distance. Through voyages led by Portugal and Spain, the world expanded from a limited *orbis terrarum* to a vast globe, prompting a poetic and imaginative transformation in European society. Influential literature, including chronicles, poetry, and plays, conveyed this newfound spatial awareness, which was meaningfully shaped by the technological and scientific advancements in navigation. Writers like Duarte de Brito and João de Barros articulated both the awe and anxiety surrounding these vast distances, while works like Gil Vicente’s *Auto da Índia* captured the effects of global navigation on local lives. By the sixteenth century, spatial distance was no longer perceived as daunting but instead inspired exploration and desire. This literary evolution signaled a broader turn in European consciousness, in which the distant and unknown became accessible and even familiar, mirroring the transformative impact of nautical science and exploration on collective identity and imagination.

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In 2003 he was one of the founders of the Center for the History of Science and the graduate program in the History and Philosophy of Science, at the University of Lisbon, and later also the founder of the Department of History and Philosophy of Science; he was chair of the department in 2015–2018 and 2018–2021. He has held consulting posts at various academic and government bodies, including the National Council for Science and Technology (2012–2015), by appointment of the Prime Minister of Portugal. Henrique Leitão is a member of various learned societies, including the Lisbon Academy of Sciences, the International Academy for the History of Science, and the Pontificio Comitato di Scienze Storiche. He was the recipient of numerous academic prizes and distinctions, among which Portugal's most prestigious cultural prize (Pessoa Prize, 2014) and a presidential decoration for outstanding academic achievement (Comenda da Ordem de Sant'Iago da Espada, 2015). In 2018, he won an Advanced Grant from the European Research Council.

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1. Decoding the Oceans: Rutter-Writing and the Emergence of Oceanic Rutters as a New Textual Genre

Luana Giurgevich

Abstract: The emergence of oceanic rutters in the fifteenth and sixteenth centuries constituted a significant shift in the recording and transmission of maritime knowledge. Initially based on earlier traditions, these texts adapted to long-distance voyages by incorporating systematic observations of tides, currents, landmarks, and celestial navigation. While many remained unpublished, rutters circulated among elite scholarly networks, shaping cosmographical debates and influencing later navigational texts. This study examines how oceanic rutters were written, copied, translated, collected, organized, and preserved, highlighting their evolution from practical tools to valued cultural artifacts. Tracing the evolution of rutter writing, this chapter argues that they were essential instruments in redefining maritime space and globalization knowledge.

Keywords: circulation of knowledge, collecting practices, oral transmission, manuscript and printed traditions, textual genres, translation.

Introduction

In 1528, Robert Copland published the first English translation of Pierre Garcie's *Grand Routier de la Mer* in London.¹ This work was a classic of

1 It is possible that Pierre Garcie reworked original Portuguese nautical documents that were compiled in the late 1470s. See David Waters, *The Iberian Bases of the English Art of Navigation in the Sixteenth Century* (Coimbra: [Separata da Revista da Universidade de Coimbra 24], 1970), 7. José Malhão Pereira has recently discovered strong connections between Garcie's rutter and

Mediterranean navigational practices and was published during a time of great textual ferment, in which Atlantic coastal navigation was developing more detailed sailing directions, with a focus on tidal behavior.² The northern European *forma mentis* of this period was characterized by an emphasis on specific coastal areas, short-distance routes, and a “delimited” and “horizontal” space.³ However, deeper changes were already underway as European navigators also had access to newer written tools. Much of such vital navigational information circulated through handwritten texts coming from Iberia.

In the year 1533, John à Borough (Aborough, 1494–1570), a highly skilled and experienced sailor who frequently navigated between the West Countries, France, Ireland, and various ports in the Mediterranean, possessed a well-equipped collection of navigational materials including charts, maps, instruments, and texts. Borough was not an exception to the trend and had access to innovative navigational sources, his professional tools including at least two Iberian texts: a Portuguese book of *ephemerides* and a Spanish rutter.⁴

In the following decades, similar manuscript sources were acquired by André Thevet, the royal cosmographer of France (1516–1592). One such manuscript, the *Livro de marinharia de Manuel Álvares* (Manuel Álvares’s

the earliest Portuguese books of seamanship. See José Malhão Pereira, “Roteiros portugueses, séculos XVI a XVIII. Sua gênese e influência no estudo da hidrografia, da meteorologia e do magnetismo terrestre” (PhD diss., Universidade de Lisboa, 2017), 32, recently transformed into a book (Porto: Fronteira do Caos, 2022). On Pierre Garcie, see also the recent edition by Michel Bochaca and Laurence Moal, *Le Grand Routier de Pierre Garcie dit Ferrande. Instructions pour naviguer sur les mers du Ponant à la fin du Moyen Âge* (Rennes: Presses universitaires de Rennes, 2019).

2 David Waters, *The Rutters of the Sea: The Sailing Directions of Pierre Garcie: A Study of the First English and French Printed Sailing Directions with Facsimile Reproductions* (New Haven: Yale University Press, 1967).

3 On this topic, see Matthew Boyd Goldie, “An Early English Rutter: The Sea and Spatial Hermeneutics in the Fourteenth and Fifteenth Centuries,” *Speculum* 90, no. 3 (2015): 701–727 (especially 704), <https://www.jstor.org/stable/43577433>.

4 An inventory of items is included in the petition submitted to the High Court of Admiralty regarding the loss of two sea chests. According to Baldwin, the Portuguese book of *ephemerides* in question could be the *Repertório dos tempos* (Repertoire of Times), which was published by Valentim Fernandes in 1518. See R. C. D. Baldwin, “The Development and Interchange of Navigational Information and Technology between the Maritime Communities of Iberia, North-Western Europe and Asia, 1500–1620” (Master’s thesis, Durham University, 1980), 76. The Borough’s nautical instruments consisted of a Portuguese *balestilha* (cross-staff) and two Spanish compasses, as noted by Sarah Tyacke, “Chartmaking in England and its Context, 1500–1660,” in *History of Cartography*, ed. David Woodward, vol. 3, part 2 (Chicago: University of Chicago Press, 2007), 1738.

book of seamanship), currently housed in the National Maritime Museum, Greenwich, bears Thevet's ownership mark.⁵ This extensive collection of nautical materials was not the only maritime technical source to which Thevet had access. Thevet was known to be skilled in the practice of rutter-writing and had firsthand knowledge of a vast array of oceanic sailing directions.⁶

Iberian nautical writings were widely circulated, copied, read, and translated during this period. Another remarkable example is a navigational manual used by Francis Drake (1540?–1596) during his voyages. This manual, which was translated from Portuguese and Spanish to English, contained the descriptions of European and Brazilian sea routes, as well as a rutter for navigating the Strait of Magellan. However, Drake was not completely satisfied with simply appropriating the writings of the Iberian pilots. He aimed to extract more and more oceanic knowledge from Nuno da Silva and Alonso Sánchez Colchero, valuable prisoners under his control. To this end, Drake personally took extensive notes of his conversations with these experienced pilots, placing Iberian knowledge at the heart of a rich, multilingual tradition.⁷

Another significant example of manuscript dissemination can be found in the logbooks of João de Castro (1500–1548), a Portuguese viceroy and

5 The codex was previously owned by the historian Charles R. Boxer. See National Maritime Museum, Greenwich, *Roteiro de Nauegação daqui pera y India*, ms. P/31.

6 Prior to Hakluyt's publication, Thevet was familiar with Jean Alfonse de Saintonge's rutter and other travel accounts. On this topic, see P. E. H. Hair, "Some Minor Sources for Guinea, 1519–1559: Enciso and Alfonse/Fonteneau," *History in Africa* 3 (1976): 19–21; Roger Schlesinger and Arthur P. Stabler, *André Thevet's North America: A Sixteenth-Century View. An Edition–Translation* (Kingston: McGill–Queen's University Press, 1986) XXVII–XXIX. Nuno Vila-Santa has authored several works on the Portuguese policy of secrecy (*política do sigilo*) and the parallel, uncontrollable circulation of sensitive information. See, among others, his recent book: Nuno Vila-Santa, *Knowledge Exchanges between Portugal and Europe: Maritime Diplomacy, Espionage, and Nautical Science in the Early Modern World (15th–17th Centuries)* (Amsterdam: Amsterdam University Press, 2024).

7 For information on the manual that Drake translated into English, see Richard Boulind, "Drake's Navigational Skills," *The Mariner's Mirror* 54, no. 4 (1968): 349–371, <https://doi.org/10.1080/00253359.1968.10659458>. On Nuno da Silva, see the recent study by José María Moreno Madrid and David Salomoni, "Nuno Da Silva's *Third Relation*: An Unknown Report on Francis Drake's Voyage (1577–1580)," *Terrae Incognitae: The Journal of the Society for the History of Discoveries* 54, no. 1 (2022): 64–82, <https://doi.org/10.1080/00822884.2022.2048246>. Further examples of English translations of Spanish maritime texts can be found in the work of Christine Marie Petto, "Chart Making in England and France, and Charting in English Channel," in *Mapping and Charting in Early Modern England and France: Power, Patronage, and Production* (Lanham: Lexington Books, 2015), 80–85. See in particular the subchapter "Sixteenth-Century Sailing Directions in England and France."

governor. These texts, which were influenced by the mathematician Pedro Nunes (1502–1578), who served as Castro's "cosmographic advisor,"⁸ were renowned for their innovative approach to key nautical issues and included rigorous scientific discourses and systematic observations. Some scholars even considered Castro a pioneering author in the evolution of oceanic rutters as a genre.⁹ Castro's logbooks enjoyed far-reaching circulation until at least the early eighteenth century. Evidence of their influence can be seen in many texts. Simão de Oliveira included close readings of the *Roteiro de Lisboa a Goa* (Rutter from Lisbon to Goa, 1538) in his art of navigation, which was printed in Lisbon in 1606.¹⁰ Lengthy passages from the logbook were copied and adapted into instructional chapters on navigating the Indian Ocean. Oliveira used Castro's work almost verbatim, indicating a thorough knowledge of it.¹¹ In addition, the *Roteiro do Mar Roxo* (Rutter of the Red Sea, 1541) was translated into English and published by Samuel Purchas in his travel anthology in 1625, preceding any Portuguese publication.¹² Interestingly, Purchas acknowledged the exceptional nature of Castro's text, claiming that it provided "a more full intelligence of the Red Sea, than any other Rutter I have seen."¹³ This text continued to be translated into various languages until the mid-eighteenth century. As such cases

8 Bruno Almeida portrayed Pedro Nunes as a *consultor cosmográfico* (cosmographic advisor) for Castro's voyages. See Bruno Almeida, "A influência da obra de Pedro Nunes na náutica dos séculos XVI e XVII: um estudo de transmissão de conhecimento" (PhD diss., Universidade de Lisboa, 2011), 149.

9 For further insights, see the substantial contribution of Charles R. Boxer, "Portuguese roteiros, 1500–1700," *The Mariner's Mirror* 20, no. 2 (1934): 174–176. <https://doi.org/10.1080/00253359.1934.10655747>.

10 The first edition of the text is a nineteenth-century transcription by João de Andrade Corvo, *Roteiro de Lisboa a Goa, por Dom João de Castro* (Lisboa: Typ. da Academia Real das Sciencias, 1882). Full bibliographical information on all editions and translations of Castro's rutters can be found in Luana Giurgevich, "Roteiros portugueses dos séculos XV e XVI (Manuscritos)," *RUTTER Technical Notes Series* 7, no. 1 (April 30, 2021): 52, <https://doi.org/10.6084/m9.figshare.14529084>.

11 A good example is the chapter "Como se deve navegar do Cabo das Correntes para Moçambique" (How to Navigate from the Cape Correntes to Mozambique). See Simão de Oliveira, *Arte de navegar* (Em Lisboa: Por Pedro Crasbeeck, 1606), 155–156. Leonor Pedro has performed a comprehensive historical reconstruction of the sources used by Simão de Oliveira in his *Arte de navegar*. See Leonor Pedro and Luana Giurgevich, "Simão de Oliveira: A Forgotten Rutter (1606)," *RUTTER Technical Notes Series* (forthcoming 2025).

12 For an in-depth analysis of the circulation of Castro's manuscripts, see Roger Lee de Jesus, "As 'Tábuas dos Roteiros da Índia' de D. João de Castro da Biblioteca Geral da Universidade de Coimbra: novos dados," *Boletim da Biblioteca Geral da Universidade de Coimbra* 51 (2021): 75–116. On Samuel Purchas see, especially, 81–83, https://doi.org/10.14195/2184-7681_51_3.

13 Samuel Purchas, *Purchas his Pilgrimes in Five Bookes ... The Second Part* (London: Printed by William Stansby for Henric Fetherstone, 1625), 2:1122.

indicate, rutters and logbooks were progressively reaching and engaging a broader audience.¹⁴

While Purchas's activities fall neatly into a longstanding trend, it is surprising how quickly rutters gained new readers. Since the early 1500s, intellectuals in Central Europe were well apprised of recent Iberian maritime activities. Despite being based in landlocked Nuremberg, Johann Schöner (1477–1547) was up-to-date on the long-distance oceanic voyages of his time, and provided his audience with recent data derived from contemporary oceanic rutters. Schöner's comprehensive cosmographic treatise, *Luculentissima quaedam terrae totius descriptio*, published in 1515, translated sailing directions used by the naval fleets of Jorge de Aguiar and João de Sousa de Lima a few years earlier, between 1508 and 1513.¹⁵ These nautical and technical writings, both preserved and lost, represent some of the earliest written records addressing the new challenges of oceanic navigation.

With Vasco da Gama's expeditions, the Portuguese began to sail regularly to India, and the Cape of Good Hope marked the start of navigation across the waters of different oceans. A proliferation of writings followed almost immediately.¹⁶ Portuguese ships were crewed not only by sailors but also by soldiers, civil servants, merchants, and missionaries, all of whom recorded pieces of the newfound oceanic knowledge being accumulated through letters, travelogues, treatises, logbooks, rutters, charts, and other texts. Often, these non-professional agents directly influenced the course of navigation, contradicting the pilots, each with their own nautical charts in hand, eager to contribute to the oceanic voyage. All these elements contributed to the emergence, in the words of the Portuguese scholar Joaquim Barradas de Carvalho, of "a new literature" with "new authors," including both "navigation technicians," and authors that "do a bit of everything: and are simultaneously *roteiristas* (authors of rutters), geographers, cosmographers, and at times, historians and chroniclers."¹⁷ After the 1480s,¹⁸ rutter-writing became a sys-

14 The subject of translations is also covered in Giurgevich, "Roteiros portugueses," 64.

15 The only existing traces of these rutters are in Schöner's text. See Juan Gil, "Johann Schoener y los descubrimientos geográficos," in *Uma vida em História. Uma homenagem a António Borges Coelho*, ed. António Dias Farinha, José Nunes Carreira and Vítor Serrão (Lisboa: Caminho, 2001), 235–263. I am grateful to Professor Henrique Leitão for providing this information.

16 Rui Manuel Loureiro, "Indian Ocean, European Exploration," in *Literature of Travel and Exploration: An Encyclopedia. Volume one, A to F*, ed. Jennifer Speake (London: Routledge Taylor & Francis Group, 2013), 607.

17 Joaquim Barradas de Carvalho, *O Renascimento português: Em busca da sua especificidade* (Lisboa: Imprensa Nacional-Casa da Moeda, 1980), 17.

18 The first evidence of rutter-writing emerged during this period. For a comprehensive list of Portuguese manuscript rutters, see Giurgevich, "Roteiros portugueses," 1–158.

tematic practice in Iberia. The growing demand for detailed sailing directions was driven by the increasing complexity of long-distance navigation and the recognition of sea routes as a sign of global interconnectedness. On another level, rutter-writing gradually became standardized and highly regulated by the Iberian Crowns during the late sixteenth century and played a crucial role in the professionalization of Iberian pilots and cosmographers.¹⁹ The unprecedented oceanic expansion fostered close collaboration between “practical men” and “theoretical men,”²⁰ as evidenced in the writing practices of Portuguese cosmographer João Baptista Lavanha (ca. 1550–1624). In the 1595 dedication of the *Regimento náutico*, written under the auspices of King Philip II, Lavanha stated that he had altered the original text deposited in the Escorial, based on recent productive discussions with sailors. He felt the need to revise the text and eliminate “the most speculative [issues], less suited to their practice.”²¹ Lavanha’s collaboration with pilots was so deep-rooted that it challenged the conventional notion of rutter authorship. It is impossible to quantify Lavanha’s contribution in the production of rutter texts;²² he fits perfectly into the category of “new authors” (i.e., those authors that “do a bit of everything”) described by Barradas de Carvalho. Notably, the royal cosmographer was involved in the preparation of the posthumous edition of the final volume of Barros’s *Ásia* (printed in Madrid,

19 The Portuguese royal cosmographer, Manuel de Figueiredo, considered rutters to be a critical component in the evaluation of pilots and included them in his *Hydrographia, exame de pilotos*, which was first published in Lisbon in 1608 by Vicente Álvares. See Manuel de Figueiredo, *Hydrographia, exame de pilotos, no qual se contem as regras Que todo Piloto deve guardar em suas nauegações, assi no Sol, variação dagulha, como no cartear, co[m] algu[m]as regras da nauegação Leste, Oeste, com mais o Aureo numero, Epactas, Marès, & altura da Estrella Pollar. Com os Roteiros de Portugal pera a India, & Malaca, segu[n]do Vicente Rodriguez Piloto Mór, & agora nouamente pellos Pilotos modernos. Com mais os Roteiros do Brasil, Rio da Prata, Guiné, S. Thomè, & Angolla* (Em Lisboa: Impresso por Vicente Aluarez, Anno 1608).

20 The idea of an Iberian collaborative environment and the artisanal origins of modern science are discussed by Henrique Leitão and Antonio Sánchez, “Zilsel’s Thesis, Maritime Culture, and Iberian Science in Early Modern Europe,” *Journal of the History of Ideas* 78, no. 2 (2017): 191–210, <https://doi.org/10.1353/jhi.2017.0010>, and Antonio Sánchez, “Charts for an Empire: A Global Trading Zone in Early Modern Portuguese Nautical Cartography,” *Centaurus* 60, no. 3 (2018): 173–188, <https://doi.org/10.1111/1600-0498.12198>.

21 See João Baptista Lavanha, *Regimento nautico* (Lisboa: Em casa de Simão Lopes, 1595), n.p. Interestingly, Lavanha’s work highlights the dichotomy between practical and theoretical knowledge, as represented by two distinct pieces advice to readers: *Ao speculativo matemático* (To the speculative mathematician) and *Ao práctico navegante* (To the practical navigator), while at the same time emphasizing the importance of intellectual training for pilots.

22 António José Duarte Costa Canas provides a clear and effective explanation of the problem related to textual attribution. See António José Duarte Costa Canas, “A obra náutica de João Baptista Lavanha (ca. 1550–1624)” (PhD diss., Universidade de Lisboa, 2011), 48–72.

1615),²³ an activity exemplifying the complex epistemological processes that these “new authors” were known for.

The initial section of this essay elucidates the definition of oceanic rutters, followed by an in-depth analysis of the application of rutter-writing to less technical ambits. Oceanic rutter-writing did not merely produce a crucial tool for long-distance navigation, but also ushered in a historical turning point, changing the way humanity understood the world and space. It thus represented a gateway to shared global knowledge in a manner far surpassing its antecedents.

The second section concerns the idea of shared knowledge, and delves into the contexts in which rutters came to be preserved. The appearance of rutters (in manuscript collections) and their systematic organization (in both manuscript and printed collections) provide valuable insights into the history of the transmission of such texts and their significance, painting a picture of the enduring flow of information at a global scale. While certain authors may have achieved substantial circulation from a numerical standpoint, it was the recognition of oceanic rutters (in their collective form) as a well-defined bibliographical object that represented a true shift in perception.

1.1. The Definition of the Oceanic Rutter

1.1.1. *Categories of Maritime Literature*

When considering textual genres, a multitude of specific criteria, patterns, cultural categories, and formal identifiers come to mind. Several scholars have attempted to clarify the meaning of these writings and have proposed different classification models for Iberian maritime literature, including rutters.²⁴ These classifications have been based on linguistic features and the functions of the texts, with some scholars focusing specifically on the

23 It is noteworthy that Lavanha's revisions of Barros's drafts included the addition of new visual materials. See Armando Cortesão and Avelino Teixeira da Mota, “João Baptista Lavanha, três cartas gravadas na *Quarta Década da Ásia*, 1615,” in *Portugaliae Monumenta Cartographica*, eds. Armando Cortesão and Avelino Teixeira da Mota (Lisboa: Imprensa Nacional-Casa da Moeda, 1987), 4:71–72. For an examination of Lavanha's meticulous editorial adjustments, see Rui Manuel Loureiro, “João Baptista Lavanha, cosmographe portugais, et la chronique d'Asie au début du XVIIe siècle,” *e–Spania* (October 28, 2017), OpenEdition Journals, <https://doi.org/10.4000/e-spania.27316>.

24 Among recent contributions, see the works of António Silva Ribeiro, *A hidrografia nos descobrimentos portugueses*, 3rd ed. (Mem Martins: Publicações Europa-América, 1994); Maria Armada Ramos Taveira, “Os roteiros portugueses do Atlântico de finais do século XV à primeira

scientific and nautical aspects of sixteenth-century travel literature.²⁵ Following the categories proposed by various scholars, the main technical genres include: *livros de construção naval* (shipbuilding books), *livros de marinharia* (seamanship manuals), *guias náuticos/regimentos* (nautical guides and rules), *cosmografias* (cosmographies, atlases, and geographical treatises), *repertórios dos tempos* (almanacs), *diários de bordo* (logbooks), *relações de naufrágios* (shipwreck accounts), and *roteiros de navegação* (nautical rutters).²⁶ However, these categories could be even more extensive, taking into consideration *artes de navegar* (navigation manuals), *exames dos pilotos* (examinations for pilot training), *navegações* (travel accounts of navigation), commercial writings, and other types. The need to distinguish between literary and technical aspects has sometimes led scholars to controversial interpretations. The distinction between rutters and logbooks, for instance, is often debated. Some scholars view logbook narratives as a specific stage in the production of rutters,²⁷ while others treat the two genres as identical. Still others argue they are distinct, each with its own unique characteristics.²⁸ Underlying these discussions are some generally accepted but limited definitions of the genres. A basic definition of a rutter acknowledges its primary purposes of specifying sea routes and providing detailed instructions to pilots, thus ensuring safe navigation.²⁹

The varying typologies suggested by scholars reflect the hybrid nature of maritime texts and the challenges posed by such materials. It is for these

década do século XVII. Elementos para o seu estudo" (Master's thesis, Universidade Nova de Lisboa, 1994); Malhão Pereira, "Roteiros portugueses, séculos XVI a XVIII."

25 See, especially, the categorization of João Rocha Pinto, *A viagem: memória e espaço. A literatura portuguesa de viagens: Os primitivos relatos de viagem ao Índico, 1497–1550* (Lisboa: Sá da Costa, 1989), 57.

26 This is a condensed summary of various genre classifications of early modern Portuguese travel literature. See, among others, Pinto, *A viagem: memória e espaço*; Abel Fontoura da Costa, *A marinharia dos descobrimentos* (Lisboa: Agência Geral do Ultramar, 1960), 409–474; Carvalho, *O Renascimento português*, 18–19; Ana Celeste Silva, "Pilotos e pilotagem nas navegações portuguesas. Da prática do mar à produção escrita (Do século XVI à primeira metade do século XVII)" (Master's thesis, Universidade de Lisboa, 2006), 173–208.

27 Margarita Zamora made distinctions between more traditional and less traditional rutters, interpreting logbook narratives as a less traditional form of rutter. See Margarita Zamora, *Reading Columbus* (Berkeley: University of California Press, 1993), 117.

28 As recently shown by Josiah Blackmore, *The Inner Sea: Maritime Literary Culture in Early Modern Portugal* (Chicago–London: The University of Chicago Press, 2022), 55–65.

29 A definition of nautical rutters within a strictly nautical context was suggested by Jorge Semedo de Matos, "Roteiros," in *Dicionário de história dos descobrimentos portugueses*, ed. Francisco Contento Domingues (Lisboa: Círculo de Leitores, 2016), 2:918–920.

reasons that the present chapter explores not only nautical rutters as such, but also other texts with similar features that may not fit the strict definition of a rutter but would have made sense for a sixteenth-century reader. Such a comprehensive approach is particularly apt for this period, when the definition of rutter was in constant evolution. It is not uncommon when perusing early modern rutters to encounter a shift from the usual style at a certain point; suddenly, the reader is met with the narration of a specific voyage, or with content more typical of a logbook. From a material perspective, the categories referred to in this chapter may consist of fragmented notes, original texts, or copies of specific rutters. They may be adaptations of original rutters to new textual contexts, or physical collections, or even diversified anthologies of texts. The utilization of all these categories aims to shed light on the processes of rutter-writing, rather than establish an inflexible typology into which all texts must fit.

1.1.2. *The Oceanic Rutter*

The use of “oceanic rutter” (*roteiro oceânico*) as a historical classification is not recent. In the late 1960s, Avelino Teixeira da Mota introduced the concept of “oceanic rutter” as a new textual genre.³⁰ But what does “oceanic” really mean? In proposing such nomenclature, Teixeira da Mota added a novel dimension to nautical rutters, shifting the focus from a purely technical representation of sea routes linking distant geographical locations to the expression of navigation as an epistemological experience. Luís de Albuquerque observed that oceanic rutters were not rigid and immutable texts,³¹ but were instead an adaptable genre that evolved over time. The organization of these texts into categories should consider their hybrid nature and their variations in content, form, and structure throughout the centuries.

Later, in 1992, Mariano Cuesta Domingo suggested a new way of examining cosmographical treatises of oceanic origin. He argued that such descriptions were “real charts and maps put into prose” (“son verdaderas cartas o mapas

30 Avelino Teixeira da Mota, “Evolução dos roteiros portugueses durante o século XVI,” *Revista da Universidade de Coimbra* 24 (1968), quoted from *Separata* (Lisboa: Junta de investigações do ultramar, 1969), 31. Other novel oceanic genres were also created, such as Francisco Faleiro’s nautical treatise, as discussed by Carmo Lacerda, “Entre Lisboa e Sevilha: Contribuições náuticas de Francisco Faleiro” (Master’s thesis, Universidade de Lisboa, 2021). See also chapter 2 of this volume by Carmo Lacerda “Sixteenth-Century Nautical Treatises: The Definition of a New Genre of Technical Literature.”

31 Luís de Albuquerque, *Le ‘Livro de Marinharia de Gaspar Moreira’* (Lisboa: Junta de Investigações do Ultramar, 1977), XVI.

puestos en prosa”).³² Subsequently, other scholars expanded this “textual cartography” to encompass new oceanic textual genres such as rutters and itineraries, linking them with an Iberian “vernacular production.”³³ The integration of visual, written, and memorized materials played a crucial role in fostering the growth of a shared oceanic textual tradition among diverse communities. Furthermore, the visual elements endemic to oceanic textual genres shed light on the prevalence of “code-switching” practices in early modern era. By code-switching practices, I refer to the simultaneous employment of multiple codes, including linguistic, numerical, instrumental, visual, memorized, and gestural. In the sixteenth century, a pilot was required to repeatedly alternate between such codes in the exercise of a diverse set of duties, such as handling an astrolabe, analyzing a nautical chart, and taking notes. Such code-switching formed part of a continuous process of knowledge translation.³⁴

Concurrently, the average reader of the time served as a “virtual witness” to oceanic navigation by having access to constantly evolving knowledge that was transformed from one code to another and transmitted through various agents, such as the pilot, cosmographer, cartographer, historian, writer, editor, and printer, among others.³⁵ Each of these individuals played a crucial role in constructing the image of the world. There was a growing number of individuals who became active contributors in shaping a global (oceanic) understanding of the world, many of whom only had indirect

32 Mariano Cuesta Domingo, “La cartografía ‘en prosa’ durante la época de los grandes descubrimientos americanos,” in *Congreso de Historia del Descubrimiento (1492–1556)*. *Actas*, ed. Real Academia de la Historia–Confederación Española de Cajas de Ahorros (Madrid: Real Academia de la Historia, 1992), 286.

33 See Zamora, *Reading Columbus*, 106–114; and on vernacular maritime literature: Antonio Sánchez, “Cartografía en lengua romance: *Las cartas de marear* en los regimientos y manuales españoles sobre el arte y la ciencia de navegar,” *Boletín de la Real Sociedad Geográfica* 146 (2010): 161–187.

34 It is also worth mentioning the continued use of hand gestures in a maritime context for specific calculations. For instance, a collection of seventeenth-century Spanish rutters includes an explanation of how to calculate the dominical letter using gestures, which were crucial for memorization. The method, “Modo de sacar la letra dominical de cualquier año por la mano,” is documented in the Museo Naval, Madrid, ms. 1202, p. 52, and has recently been published by Rodrigo Moreno Jeria and Jorge Ortiz Sotelo, *Un derrotero del Mar del Sur. El Pacífico Americano a fines del siglo XVII* (Santiago de Chile: Ediciones Biblioteca Nacional de Chile, 2018), 21.

35 Steven Shapin and Simon Shaffer introduced the idea of a “literary technology of virtual witnessing,” in which the reader is virtually guided to replicate scientific experiments. However, the context in which the term “virtual witnessing” is used here is distinct. See Steven Shapin and Simon Shaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton University Press, 1985), 60.

experience with long-distance voyages. The linguistic features present in oceanic rutters, such as the use of a didactic second-person singular or plural, along with visual/textual strategies, facilitated the virtual recreation of these voyages. The utilization of the “how-to format” and synthetic formulas in rutter-writing provided immediacy to the oceanic experience.

Recent studies (in particular the research of Gianna Pomata) have demonstrated that certain literary genres, such as recipe books, should be considered “epistemic genres,” or genres that are “intrinsically social” and actively engaged in scientific “community-building” processes.³⁶ As Pomata explains, the *Observationes* served as a novel form of medical writing, but the genre was confined to the *res publica medica*. The case of oceanic textual genres was somewhat different. Margaret Schotte regards the history of the early modern nautical logbook, spanning from Columbus to Cook, as a failure in terms of epistemic genre. This failure is attributed to the growing diversity of audiences, the deviation from the original purpose of the texts, and the interdisciplinary character of nautical logbooks.³⁷ Yet, despite Schotte’s assessment, it was precisely this adaptable nature that emerged as the oceanic genre’s true strength. By applying the concept of “epistemic genres” to oceanic genres, we recognize that the *res publica nautica* encompassed a broader community of readers and “experiencers” of the sea than might be expected. Oceanic rutters, as tools for a global community building effort, contributed to a flexible and rich narrative, shaping global readership during the early modern era.

1.1.3. *Oceanic Rutters in the “Textual Network”*

Across the early modern period, the experience of long-distance voyages was intertwined with a multitude of textual genres. A closer examination of oceanic rutters reveals their intersections with various categories of writing, in such a way that the same text could belong to two, three, or even more textual types. During the sixteenth and seventeenth centuries, the boundaries between textual genres were porous, as evidenced by the frequent overlap of forms and terminologies; the rutter was no exception,

36 Gianna Pomata, “Sharing Cases: The *Observationes* in Early Modern Medicine,” *Early Science and Medicine* 15 (2010): 197, <https://doi.org/10.1163/157338210x493932>. See also Gianna Pomata, “The Recipe and the Case: Epistemic Genres and the Dynamics of Cognitive Practices,” in *Wissenschaftsgeschichte und Geschichte des Wissens im Dialog / Connecting Science and Knowledge*, ed. K. von Greyerz, S. Flurbacher, and P. Senn (Göttingen: V&R unipress, 2013), 131–154.

37 Margaret Schotte, “Expert Records: Nautical Logbooks from Columbus to Cook,” *Information and Culture: A Journal of History* 48, no. 3 (August 2013): 281–322, <https://www.jstor.org/stable/43737467>.

occupying a position of ambiguity for many early modern authors and readers.³⁸ One example of this ambiguity is the anonymous account of the *Santo Alberto* shipwreck, dated to the late sixteenth century. While the text clearly follows the conventions of shipwreck literature, its introduction surprisingly emphasizes its practical value for navigation. The author explicitly states that the account was written “in the style of a rutter,” with the intention of serving as a guide for all those navigating the India Run.³⁹ In a similar vein, pilot Gaspar Ferreira Reimão (15??–1626) referred to his logbook as a rutter,⁴⁰ and the logbooks of João de Castro were regarded as rutters by both the author and his contemporaries.⁴¹ In 1606, Spanish cosmographer major Andrés Garcia de Céspedes (1560–1611) acknowledged the importance of Castro’s “rutters” as models for Spanish navigators, describing them as recounting each day of the journey from Lisbon to India, including the sea route and the position of the ship confirmed on board by the major pilot and by another figure, called the Doctor.⁴² Although the distinction between logbooks and sailing directions was not always salient to early modern writers, there is a significant difference between the two. The logbook narrative is marked by the passage of time, recorded day by day, with the “space-line” of the voyage defined by the navigational “time-line.” In contrast, contemporary rutters were characterized by their focus on the establishment and institutionalization of an oceanic route to be repeated, rather than a specific voyage. Thus, rutters were devoid of any

38 The nautical instructions of Vasco da Gama and the logbooks of João de Castro are among the most controversial texts, as demonstrated by the categorizations of Max Justo Guedes, “A Carreira da Índia—Evolução do seu roteiro,” *Navigator* 20 (1985): 1–36, and Matos, “Roteiros,” 918–920.

39 Glória de Santana Paula, “Um manuscrito anônimo do naufrágio da nau *Santo Alberto* (1593),” *Limite* 13, no. 1 (2019): 135–157 (especialmente 140–141) <https://revista-limite.unex.es/index.php/limite/article/view/1664>.

40 Gaspar Ferreira Reimão, “Diário da navegação da nau S. Pantaleão, da Índia para Portugal, no ano de 1596,” in *Diários de navegação da Carreira da Índia nos anos de 1595, 1596, 1597, 1600 e 1603*, ed. Quirino da Fonseca (Lisboa: Academia das Ciências, 1938), 284.

41 Dom João de Barros (ca. 1496–1570), who held the position of *feitor da Casa da Índia e Minas* (chief administrator of the Overseas Trades) appointed by the king, wrote about information obtained from the *Rutter of the Red Sea*. See João de Barros, *Segunda decada da Asia de Joa[m] de Barros dos feitos que os Portugueses fizeram no descobrime[n]to e co[n]quista dos mares e terras do oriente* (Lisboa: Impressa per Germão Galharde, 1553), 114r. Historian Charles Boxer reported that Sir Walter Raleigh purchased a copy of Castro’s rutter for a substantial sum in the early 1940s. See Boxer, “Portuguese roteiros, 1500–1700,” 175.

42 Andrés Garcia de Céspedes, *Regimiento de navegacion q[ue] mando haser El Rei nuestro Señor por orden de su Consejo Real de las Indias a Andres Garcia de Cespedes su cosmografo maior siendo Presidente en el dicho Consejo el conde de Lemos* (Madrid: Juan de la Cuesta, 1606).

contingency or unexpected event. Many rutters were written or re-written after multiple navigations, reflecting the accumulation of experience over several years by one or more experienced pilots.⁴³ Logbooks, navigations, and even shipwreck accounts traced a specific sea route, while rutters introduced a different understanding of a ship's path. Logbooks recorded the journey as a straight line, experienced with all its unexpected events, while oceanic rutters transformed the sea route into a "safe space."⁴⁴ Iberian sailors saw the oceanic space as a network of nodes, where known positions, dangers, resources for reprovisioning, and their identifiability guided the movement of the vessel. The primary concern for a pilot was to avoid dangerous shallows or to locate a specific island.⁴⁵ Because the aim of the rutter was to transmit the best possible sea route to future generations, it necessarily takes a form structurally distinct from a logbook. The sea route of rutters was represented by a series of alternatives to potential obstacles, and can be seen as a "broken linearity," with multiple options described. Rutters also allowed for alterations of trajectory, making them different from logbooks. In terms of structural features, rutter-writing introduced zigzagging sea routes, or even circular paths.⁴⁶ It was not, however, devoid of temporal awareness, as it organized time by means of reference to different seasons, monsoons, departure schedules, and other elements contributing to the development of a "narrative of navigational possibilities."

In *The Globe on Paper*, historian Giuseppe Marcocci reflects on how "the mobility of person and goods across different parts of the globe over the centuries generated the perception of a shared history of the world."⁴⁷ This phenomenon gave rise as well to a sense of interconnected narratives, linking the globe in a collective historical and geographical consciousness.

43 The compilations produced by pilots nominated for specific surveys do not fall into this category. An example of such a compilation is the rutter written by Manuel Mesquita Perestrelo, commissioned by King Sebastião (1557–1578). See *Roteiro da África do sul e sueste desde o Cabo da Boa Esperança até ao Cabo das Correntes (1576) por Manuel Mesquita Perestrelo*, ed. Abel Fontoura da Costa (Lisboa: Agência Geral das Colonias, 1939).

44 The concept of an oceanic safe space has been introduced by Brian Patrick Jones, see Brian Patrick Jones, "Making the Ocean: Global Space, Sailor Practice, and Bureaucratic Archives in the Sixteenth-Century Spanish Maritime Empire" (PhD diss., University of Texas, Austin, 2014), 216, <https://repositories.lib.utexas.edu/handle/2152/28409>.

45 This aspect is well explained by Jones, "Making the Ocean," and Jorge Semedo de Matos, *Roteiros e rotas portuguesas no Oriente nos séculos XVI e XVII* (Lisboa, Centro Cultural de Macau-Fundação Jorge Álvares, 2018).

46 This idea is exemplified by the *torna-viagem* (homeward run) of the *Carreira da Índia* (India Run), first described in the rutter of Diogo Afonso.

47 Giuseppe Marcocci, *The Globe on Paper: Writing Histories of the World in Renaissance Europe and the Americas* (Oxford: Oxford University Press, 2020), 49.

In this ambiance, oceanic rutters (understood here not merely as tools, but as texts) played a central role. Prominent intellectuals quickly recognized the stylistic and narrative power of oceanic rutters (particularly chroniclers, as mentioned above), viewing oceanic rutters as an expeditious instrument for the historical interpretation of the world. João de Barros (ca. 1496–1570), the Portuguese official chronicler, declared that his work was composed “in the manner of a nautical rutter” (“à maneira de roteiro de navegar”), and that this was the only feasible method for providing a “universal” (global)⁴⁸ description of ports and lands throughout the Oriental world.⁴⁹ Interestingly, while writing his own “rutter,” Barros invited the reader, who had never witnessed the “profile of this Oriental coast,” to use their imagination and visualize the new spaces depicted through words by employing their left hand.⁵⁰ This enabled Barros to make navigation less virtual and more tangible. With a similar goal, the Jesuit Father Mestre Belchior Nunes Barreto (1520–1571) used the rutter as a writing tool in a letter he wrote from Macau on November 23, 1555. In this letter, he promised to draft the “rutter” of the voyage he made with other missionaries from Malacca to Macau.⁵¹ The technical content of rutters transcended textual boundaries, becoming ever more fluid in the process.

It is noteworthy that the term *roteiro* (rutter) appeared in the first volume of the travel collection of Giovanni Battista Ramusio (1485–1557),

48 According to Rui Manuel Loureiro, the *Décadas da Ásia* can be considered “a kind of global history *avant la lettre*.” See Loureiro, “João Baptista Lavanha, cosmographe portugais, et la chronique d’Asie.”

49 See in particular the introduction to the ninth book of the *Primeira decada* in João de Barros, *Asia de Joam de Barros dos factos que os Portugueses fizeram no descobrimento e conquista dos mares e terras do Oriente: Da primeira decada* (Lisboa: Imprensa por Germão Galharde, 1552), 150v–106r. Josiah Blackmore has pointed out the similar narrative strategies used in Fernão Lopes de Castanheda’s historiographic writing. See Blackmore, *The Inner Sea*, 61–65.

50 Rui Manuel Loureiro has recently highlighted Barros’s innovative writing techniques, specifically the use of “narrative pauses,” that emphasized the description of geographical (and maritime) spaces. See Rui Manuel Loureiro, “Revisitando as *Décadas da Ásia*: Algumas observações sobre o projecto historiográfico de João de Barros,” *e–Spania* (June 30, 2018), OpenEdition Journals, <https://doi.org/10.4000/e-spania.27836>. On the reader’s awareness of new spaces through the use of hands, see Francisco Roque de Oliveira, “Lançando linhas imaginárias: metageografias da Ásia nas descrições geográficas e na cartografia portuguesa do século XVI,” *Scripta Nova. Revista electrónica de geografía y ciencias sociales* 20, no. 551 (2016): 5, <https://doi.org/10.1344/sn2016.20.17330>.

51 The expression *roteiro da nossa viagem* (“the rutter of our voyage”) is also used by Barreto in another letter related to a journey from Cochín to Malacca (December 3, 1554). See *Cartas que os Padres e Irmãos da Companhia de Jesus, que andão nos Reinos de Japão escreverão aos da mesma Companhia da Índia, e Europa, desde o ano de 1549 até o de 1566 ...* (Coimbra: António de Maris, 1570), 80 and 82.

in the report from Juan Gaitán, the pilot of the Ruy López de Villalobos's expedition. The Spanish pilot described how he was able to uncover the secrets of Portuguese navigation, but at the same time, expressed frustration about the lack of longitude information in the *derotteri* (rutters), the "books that the Portuguese used for navigation."⁵² While the first known definition of a *roteiro* (rutter) was given by Duarte Pacheco Pereira (1460–1533) in the *Esmeraldo de situ orbis* at the beginning of the sixteenth century (1505–1508),⁵³ the term acquired a broader meaning over time. By the end of the seventeenth century, the Portuguese physician João Curvo Semedo (1635–1719), who wrote popular pharmacopoeias, presented his recipe book as a rutter.⁵⁴

We have previously seen the close relationship between compendia of geography, cosmography, and history, and the new information obtained from oceanic rutters. Another example of this "crossing of genres"⁵⁵ can be seen in the *Roteiro Geral* (General Rutter) of Gabriel Soares de Sousa, written in 1587, a crucial text on Brazil with a great number of early modern copies.⁵⁶ Soares de Sousa's text encompasses a wide range of genres, from chronicles to sailing directions, ethnographical writings, administrative descriptions, and geographical treatises, highlighting the susceptibility of these varied modes to integration. When it comes to Soares de Sousa's work, the overlap between different discourses is evident even in the

52 The term "rutter" can also be found in its Spanish form *derrotero*, or Italianized form *derottero*. See "Relatione di Iuan Gaetan piloto castigliano del discoprimiento dell'Isole Molucche per la via dell'Indie Occidentali," in *Primo volume delle Navigazioni et Viaggi ...*, ed. Giovan Battista Ramusio (Venezia: Appresso gli eredi di Luc'Antonio Giunti, 1550), 406.

53 The very first definition of a rutter can be found in the *Esmeraldo de situ orbis* written by Duarte Pacheco Pereira (1505–1508). See the recent digital edition of this text produced by the RUTTER Project: Duarte Pacheco Pereira, *Esmeraldo de situ orbis*, RUTTER Project Edition Digital Collection no. 1 (Lisbon: ERC RUTTER Project, University of Lisbon, 2022), <https://doi:10.5281/zenodo.6498014>.

54 Benjamin Breen has underlined the importance of long-distance travels to the pharmacy profession in Curvo Semedo's work. See Benjamin Breen, "Semedo's Sixteen Secrets: Tracing Pharmaceutical Networks in the Portuguese Tropics," in *Empires of Knowledge: Scientific Networks in the Early Modern World*, ed. Paula Findlen (Abingdon: Routledge, 2018), 343. See João Curvo Semedo, *Polyanthea medicinal: Noticias galenicis, e chymicas* (Lisboa: Officina de Miguel Deslandes, 1697), 633.

55 Maria Antónia Coutinho and Florencia Miranda speak of the "crossing of genres" when a text is inscribed in more than one genre and there are "parameters associated with different genres." See Maria Antónia Coutinho and Florencia Miranda, "To Describe Genres: Problems and Strategies," in *Genre in a Changing World*, ed. Charles Bazerman, Adair Bonini and Débora Figueiredo (Fort Collins: The WAC Clearinghouse-Parlor Press, 2009), 44.

56 All extant copies of Soares de Sousa's rutters have been inventoried by Giurgevich, "Roteiros portugueses," 90–104.

ambiguity of the title: *Roteiro Geral* (General Rutter), *Notícia do Brasil* (News from Brazil), or even *Tratado descriptivo do Brasil* (Descriptive Treatise of Brazil). Thus, while pilots were certainly crucial agents in the dissemination of nautical knowledge, a substantial contribution came from non-pilot authors, such as Gabriel Soares de Sousa. Pilots were nevertheless privileged sources of information. As noted by historian of science Paula Findlen, conversations with well-informed individuals, such as pilots, were part of the *modus operandi* of the Jesuit Father José de Acosta (1540–1600), the author of the *Historia Natural y Moral de las Indias* (Natural and Moral History of the Indies) (1590).⁵⁷ Furthermore, Father Acosta sought to understand the technical aspects of navigation with the help of pilots, whom he referred to as “los maestros desta arte” (“the masters of this art”). For example, his lengthy discussion on the variation of the needle was based on the explanations of an anonymous but *muy diestro* (“very skilled”) Portuguese pilot.⁵⁸ Mediators like Gabriel Soares de Sousa and Duarte Pacheco Pereira raised critical problems of authorship and opened the way for the establishment of a specific subgenre of oceanic rutters that could be called “narrative rutters,” reflecting their joint navigational and literary features.⁵⁹

Of similar significance in the evolution of the oceanic rutter is the appearance of the “rutter of instruction”⁶⁰ (or “legal rutter”) subgenre. These sailing directions were provided in the form of legal instructions to ensure adherence to a specific sea route and were carried on board. Typically, they were brief and succinct, but in some cases, they offered valuable navigational information in greater detail. An exceptional example of a highly detailed

57 Paula Findlen has traced Jesuit networks and found that José de Acosta, a Jesuit Father, spoke extensively with pilots and even inspected their maps. See Paula Findlen, “How Information Travels: Jesuit Networks, Scientific Knowledge, and the Early Modern Republic of Letters, 1540–1640,” in Findlen, *Empires of Knowledge*, 61.

58 In addition to the Spanish pilots of Sarmiento de Gamboa’s expedition to the Strait of Magellan (Hernando de Lameroy y Gallego, and Hernando Alonso), Acosta mentioned a third informant, an anonymous Portuguese pilot. See José de Acosta, *Historia natural y moral de las Indias* (Sevilla: En casa de Juan de León, 1590), 64.

59 This subgenre of early modern rutters will be explored in chapter 5 of this volume, by Fabiano Bracht.

60 The collection of rutters belonging to the pilot major of the Casa de la Contratación in Seville has recently been fully transcribed by Carmo Lacerda and José María Moreno Madrid, “A Remarkable Collection of Rutters, 16th–18th Centuries: Derroteros que hacía el Piloto Mayor para que llevasen los jefes de las embarcaciones que iban a Indias.” *RUTTER Technical Notes Series* 6, no. 1 (March 29, 2021): 1–65, <https://doi.org/10.6084/m9.figshare.14333267>. For a definition of “rutter of instruction,” see especially 4–5.

rutter of instruction is the one carried on the ship *São Pantalião* in 1592.⁶¹ The rutter is organized into multiple chapters, highlighting important aspects of the sea route, such as navigation, sea currents, variation of the needle, geographical landmarks, and winds. This subgenre represents yet another example of the mutability of rutters, and their transcendence of the maritime context.⁶²

1.2. A Bibliographical Perspective: Oceanic Rutters as Collections

It is worth pausing at this point to address some chronological considerations, before approaching oceanic genres bibliographically. The present study examines the production of rutters, both in manuscript and in print, by Iberian authors, particularly Portuguese, from the late fifteenth to the mid-seventeenth century. The absence of documents from the early stages of rutter production (i.e., prior to 1480) does not imply that the practice was not yet established, or that navigational information was not being disseminated. Rather, this lack of evidence can be attributed to the inherent fragility of writing materials, the practical use of these texts for navigation, and their frequent updates. Analyzing the available corpus of rutters, it becomes clear that the surviving examples are in some way distinctive, and that their uniqueness was recognized by early modern collectors and readers alike.⁶³ Both the significance of maritime texts and their history (grounded in reading and book-making practices) are increasingly appreciated, permitting insights into the reception of oceanic technical genres.

61 Artur Teodoro de Matos, *Na rota da Índia. Estudos de história da expansão portuguesa* (Lisboa: Instituto Cultural de Macau, 1994), 163–184.

62 According to Charles R. Boxer, these two ports were considered occasional stops for refreshment and replenishment during the India Run. See Charles R. Boxer, “The Principal Ports of Call in the Carreira da Índia,” *Luso-Brazilian Review* 8, no. 1 (Summer 1971): 3–29, <https://www.jstor.org/stable/3512700>.

63 Comprehensive cataloguing of the early modern rutter corpus is currently underway as part of the RUTTER Project, with a portion of the results already available through its online resources (*RUTTER Technical Notes Series* and *Digital Editions*Beta*: <https://rutter-project.org/digital-editions/>, as well as the related website *A Sea of Books: RUTTER Virtual Library*: <https://www.aseaofbooks.org/>). While other inventories have been published, they are now outdated. A full publication in book format is expected in 2025: Luana Giurgevich, *Bibliotheca roteirística: Rotas oceânicas portuguesas dos séculos XV–XVIII* (Lisboa: Academia da Marinha, forthcoming 2025). Notable previous inventories include Fontoura da Costa, *A marinharia dos descobrimentos*, 409–474, and, particularly for charts and some rutters, Armando Cortesão and Avelino Teixeira da Mota, *Portugaliae Monumenta Cartographica*, 6 vols. (Lisboa: Imprensa Nacional da Moeda, 1960).

Bibliographical approaches to oceanic rutters that consider their geographical and historical context have a long tradition. During the seventeenth century, there were some attempts at compiling maritime bibliographies. One of the most interesting is Antonio de León Pinelo's *Epitome de la biblioteca oriental i occidental, nautica, i geografica* (Epitome of the Oriental and Occidental, Nautical, and Geographical *Bibliotheca*) published in 1629 (Madrid: Por Iuan Gonzalez, 1629), which gives a list of contemporary published books and manuscripts, including recent collections of Portuguese printed rutters. In his introduction (*Discurso apologético* [Apologetic Discourse]), León Pinelo emphasized the importance of texts such as “derroteros, viages, cartas y relaciones” (“rutters, voyages, letters, and relations”), and “colectores de libros de Indias” (“collectors of books on India”).⁶⁴

From very early on, oceanic rutters were seen as key components in a wider story, providing compelling epistemological insights that were validated and shared well beyond the community of scientific practitioners. Valentim Fernandes (ca. 1450–1518?), a German printer, translator, and informant who settled in Lisbon around 1490, played a crucial role in this regard. His codex (known as the *Manuscrito Valentim Fernandes* [Manuscript of Valentim Fernandes]) contained a collection of Portuguese sailing directions, significantly titled *Este livro é de rotear* (“This book Is for Navigation”). The collection brought together sailing directions and non-technical documents related to long-distance voyages. Fernandes's contribution to the field was unique in many ways, since very few works related to the Portuguese expansion and, specifically, navigational knowledge, were printed in the first half of the sixteenth century. Indeed, most belong to Fernandes's publications.⁶⁵ As such, Fernandes stood at the intersection of various textual genres, interested not only in travel literature per se, such as Marco Polo's voyages, but also in more technical and scientific works such as rutters, ephemerides, and regiments.⁶⁶

64 Antonio de León Pinelo, *Epitome de la biblioteca oriental i occidental, nautica, i geografica* ... (En Madrid: Por Iuan Gonzalez, Año de 1629). León Pinelo's work served as a reference and model for other authors, such as Nicolás Antonio, *Bibliothecae hispanae sive scriptorum hispanae gentis* ... (Roma: Ex Officina Nicolai Angeli Tinassi, 1672).

65 See, among others, Baldwin, “The Development and Interchange of Navigational Information,” 76–77. On Valentim Fernandes, see the study of Yvonne Hendrich, *Valentim Fernandes. Ein deutscher Buchdrucker in Portugal um die Wende vom 15. zum 16. Jahrhundert und sein Umkreis* (Frankfurt-am-Main: Peter Lang, 2007).

66 Valentim Fernandes published the *Regimento do astrolábio e do quadrante* in 1509, and the text can be found in the reprint of the *Histoire de la science nautique portugaise à l'époque des*

Until the end of the sixteenth century, Iberian oceanic sailing directions circulated mostly in manuscript form. Evidence of organization of these sailing directions into collections can be found in the so-called *livros de marinharia* (Portuguese books of seamanship), which were personal artefacts compiled by pilots themselves.⁶⁷ These collections took the form of long, disorganized notebooks embracing miscellaneous texts, concepts, and ideas that the pilots deemed relevant for their own use. While the *livro de marinharia* may appear chaotic in nature and could be defined as a nautical *zibaldone* (hotchpotch),⁶⁸ they reflected an internal organizational logic based on the collector's preferences. These books of seamanship were early attempts to collate texts containing both theoretical and practical nautical knowledge. It is worth bearing in mind that the education and training of pilots played a pivotal role in the transmission of oceanic knowledge. Books of seamanship, although formally idiosyncratic, are indirect witnesses to such processes. These compilations (most of which are anonymous) include myriad nautical texts, such as rules for astronomical navigation, pilot exams, questionnaires, logbooks, rutters, or even jotted notes, astronomical tables, calendars, coastal profiles, and maps. Since each seamanship book is the result of an individual's act of selection, not all of the aforementioned textual categories are necessarily included in any given book.⁶⁹ The presence of rutters within these compilations presents certain challenges, including uncertainty regarding authorship and the date of composition, as well as the constant updating of the sea routes information. For example, a single collection might bring together materials relating to different stages of the same sea route. It is noteworthy that oceanic rutters maintained their integrity and distinctiveness in such compilations of maritime technical texts.

One of the earliest examples of this type of collection is the *Livro de marinharia de João de Lisboa* ("João de Lisboa's Book of Seamanship"), which dates to the first decade of the sixteenth century. The *Suma de geographia*

grandes découvertes. Collection de documents ..., ed. Joaquim Bensaude, vol. 1 (Munich: Carl Kuhn, 1914).

67 The first reference to the category *livro de marinharia* as a specific technical maritime genre came from the 1903 edition of João de Lisboa's work. See João de Lisboa, *Livro de marinharia, Tratado da agulha de marear de João de Lisboa. Roteiros, sondas e 16 outros conhecimentos relativos à navegação*, ed. Jacinto Ignacio de Brito Rebelo (Lisboa: Libânio da Silva, 1903).

68 This definition is borrowed from the well-known work of Italian poet Giacomo Leopardi (1798–1837), *Zibaldone di pensieri*.

69 Historians have identified nine manuscripts with this connotation, with one of them not including navigational rutters. This is the case with the manuscript published by Luís de Matos, *Um livro de marinharia inédito* (Lisboa: Fundação Calouste Gulbenkian, 1969, Separata).

(“Compendium of Geography”) of Martín Fernández de Enciso (Seville, 1519), perhaps the first such manual to be printed in the Iberian Peninsula, is roughly contemporaneous. Martín Fernandez de Navarrete described the *Suma de geographia* as a *derrotero precioso* (“precious rutter”).⁷⁰ It is generally thought that Enciso drew primarily on Portuguese sources, particularly rutters, for his book. Some scholars even detect a relationship between certain chapters of Enciso’s book and André Pires’s book of seamanship, which was written around the same time.⁷¹ Again, maritime technical genres offer a glimpse into a complex network of knowledge exchange. As María Portuondo has noted, the *Suma de geographia* was “one of the first works to meld the different theoretical strands that made up the discipline of cosmography with practical aspects of navigation.”⁷²

During the sixteenth and seventeenth centuries, several compilations of travel narratives were published. Giovanni Battista Ramusio’s *Navigazioni e viaggi*, the three volumes of which were released in Venice between 1550 and 1559,⁷³ placed a significant emphasis on *navigazioni* (“navigations”), as reflected in the title. Many such travel collections recognized the significance of oceanic rutters, which were considered to contain valuable up-to-date information. Furthermore, the precise technical explications furnished by oceanic rutters served as symbols, lending authenticity to the long-distance voyages they described. The French scientist and diplomat Thévenot voiced such an opinion in his 1663 publication, *La relation de divers voyage curieux*, in which he stated that “the rutter” was “the most exact piece that has appeared in this genre” (“le routier est la piece la plus exacte qui ai paru en ce genre”).⁷⁴ Thévenot, for his part,

70 Martín Fernandez de Navarrete, *Biblioteca marítima española, obra póstuma*, vol. 2 (Madrid: Imprenta de la Viuda de Calero, 1851), 435.

71 Among others, see Hair, “Some Minor Sources for Guinea,” 37, and Thomas F. Glick, “Enciso, Martín Fernández de,” in *Diccionario histórico de la ciencia moderna en España*, ed. José María López Piñero et al., vol. 1 (Barcelona: Península, 1983).

72 On the Spanish navigation manual as a new textual genre, see María M. Portuondo, “Cosmography at the Casa, Consejo, and Corte during the Century of Discovery,” in *Science in the Spanish and Portuguese Empires, 1500–1800*, ed. Daniela Bleichmar, Paula De Vos, Kristin Huffine, and Kevin Sheehan (Stanford: Stanford University Press, 2009), 63.

73 The literature on Giovanni Battista Ramusio’s work is extensive. See especially the edition Giovanni Battista Ramusio, *Navigazioni e viaggi*, ed. Marica Milanese (Torino: Einaudi, 1978–1988). The Italian participation in the global expansion is well documented in the recent book edited by Guido Abbattista, *Global Perspectives in Modern Italian Culture: Knowledge and Representation of the World in Italy from the Sixteenth to the Early Nineteenth Century* (Abingdon: Routledge, 2021).

74 Melchisédech Thévenot, “Avis,” in *Relations de divers voyages curieux, qui n’ont point esté publiées, ou qui ont esté traduites d’Hacluyt, de Purchas, e d’autres voyageurs anglois, hollandois,*

included the Portuguese rutter of Aleixo da Mota in his collection, a text which had never before been published.⁷⁵ The authors of these general travel collections had a practical objective in including rutters in their works—the oceanic rutter as a textual genre continued to attract the attention of intellectuals, and was understood to communicate experiences directly and reliably. Indeed, earlier collections made little space for ostensibly captivating shipwreck narratives, instead focusing on the notion of “navigation” as a means of shaping the world, and highlighting its correlation to political matters.

The significance of rutter collecting is perhaps best illustrated by Jan Huygen van Linschoten (1563–1611), who visited India in 1584 and began publishing the accounts of his travels in 1595. Through his *Itinerario* (and especially a section entitled *Reys-gheschrift*), Linschoten brought Iberian rutters to a wider European audience, alerting readers to the existence of a specific corpus of trustworthy texts. Linschoten’s book was an immediate success, and was subsequently translated into several languages. While the majority of the rutters it contained were Portuguese in origin, Jan Huygen did not exclude Spanish sources,⁷⁶ suggesting that a global understanding of the Earth and its oceans was inherent in such selections. In like manner, Portuguese cosmographer Manuel de Figueiredo (1568–1622?) would later publish a substantial collection of classic Spanish sea routes in his *Hydrographia*.⁷⁷ The structure of the *Reys-gheschrift* suggests that Linschoten’s rutters derived from an assortment of Portuguese seamanship books. The type of information included (a list of places with their latitude, a regiment of leagues, a regiment on the deviation of the magnetic needle, and a set of

portugais, allemands, espagnols, et de quelques persans, arabes, et autres auteurs orientaux ... vol. 1 (A Paris: De l’Imprimerie de Jacques Langlois, 1663), n.p.

75 Aleixo da Mota’s rutter translation was first announced in 1663 and published the following year under the title “Routier pour la navigation des Indes Orientales, avec la description des isles, barres, entrées de ports, et basses ou bancs, dont la connoissance est necessaire aux pilotes,” in Thévenot, *Relations de divers voyages curieux ...* (A Paris: Chez Sebastien Cramoisy, et Sebastien Mabre Cramoisy, 1664), 2:1–60.

76 Nuno Vila-Santa has recently explored the connection between the Portuguese and Spanish rutters and their publication by Jan Huygen van Linschoten, highlighting the fact that Linschoten published sixty-three Portuguese rutters and four of Spanish origin. The author points out that the Spanish rutter described in chapter 63 is a sort of combination of several sea routes. See Nuno Vila-Santa, “Jan Huygen van Linschoten and the *Reys-gheschrift*: Updating Iberian Science for the Dutch Expansion,” *Historical Research* 94, no. 266 (November 2021): 738.

77 The various editions of Manuel de Figueiredo’s *Hydrographia* are described in Luana Giurgevich, “Bibliotheca roteirística: Edições impressas em Portugal dos séculos XVII e XVIII,” *RUTTER Technical Notes Series* 1, no. 1 (1 June 2020): 14–28, <https://doi.org/10.6084/m9.figshare.12417392>.

questions and answers for sailors) is akin to André Pires's book.⁷⁸ It may not be a coincidence that Enciso's *Suma de geographia* pulled materials from similar sources. The issue of authorship is more complicated in Linshoten's case, however, since additions were made by the *Itinerario's* editor, Cornelis Claesz (1551–1609). The *Reys-gheschrift* serves as a good example of a collaborative work,⁷⁹ a characteristic commonly observed in maritime technical literature of the early modern era. Oceanic rutters were at the forefront of this collective model of authorship.

Manuel de Figueiredo's *Hydrographia* is noteworthy in the ambit of textual transmission. A significant number of copies of the work survive, and their arrangement of nautical materials displays considerable variation across exemplars.⁸⁰ A given copy may contain a unique set of texts organized in a distinctive order, seemingly customized for a specific reader. As the first Portuguese printed collection of rutters, it adopted qualities associated with manuscript modes. This method of assembling both manuscript and printed texts into books is crucial to understanding the organization of nautical knowledge. Figueiredo's book, tailored to meet the needs of a particular owner, recalls the format of seamanship manuals.

The survival of certain manuscript collections of rutters to this day suggests that some were more likely to be preserved than others. Among those spared destruction are the compilations associated with royalty (the *piloto mayor* rutters), and those maintained by noble families (the rutters archived in the Castelo Melhor and Cadaval libraries).⁸¹ Merchant groups and religious institutions can also be credited with the safeguarding of

78 All these ideas are developed by Vila-Santa, "Jan Huygen van Linschoten and the *Reys-gheschrift*," 746.

79 See Vila-Santa, "Jan Huygen van Linschoten and the *Reys-gheschrift*," 754.

80 I consulted the extant copies conserved in the Ajuda Library (Biblioteca da Ajuda), in the Portuguese National Library, Lisbon (Biblioteca Nacional de Portugal), in the Spanish National Library (Biblioteca Nacional de España), and in the Biblioteca Pública de Évora.

81 On the pilot major see Lacerda and Moreno Madrid, "A Remarkable Collection of Rutters." The practice of aristocratic collectorship is explored in the recent contribution of Maria de Lurdes Rosa et alii, "O inventário dos documentos da Ilha da Madeira no arquivo da casa de Castelo Melhor: conteúdos, contextos e problemáticas," in *Herencia cultural y archivos de familia en los archipiélagos de la Macaronesia*, ed. Juan Ramón Núñez Pestano, Maria de Lurdes Rosa and Judit Gutiérrez de Armas (La Laguna: Instituto de Estudios Canarios-Instituto de Estudos Medievais-FSCH Universidade Nova de Lisboa, 2020), 145–162, while the rutters preserved by the Portuguese families Cadaval and Castelo Melhor have been studied and partially transcribed by several authors, including in the recent contribution by Jorge Semedo de Matos. See: Matos, *Roteiros e rotas portuguesas no Oriente nos séculos XVI e XVII*.

manuscript rutters.⁸² Many of these collections were primarily used for land-based reading, serving to sustain the historical memory of oceanic routes, prepare expeditions (whether religious, commercial, or military), and support voyage planning.

Final Remarks

Although oceanic rutters were technical texts not intended for print, and were at first designed for the exclusive use of a well-defined group of professionals, they enjoyed unprecedented levels of dissemination on the cusp of the early modern period and throughout the sixteenth century. They circulated in unexpected ways and reached individuals with diverse backgrounds, a phenomenon readily apparent in their substantial representation in libraries and archives across the world today. Written during the fifteenth and sixteenth centuries, these texts drew upon (but were not confined by) preexisting literary models. While this burgeoning genre incorporated elements from different sailing traditions (whether Mediterranean, Northern European, or Arabic), it was above all characterized by a concern with the practical difficulties of deep-sea voyages,⁸³ and long-distance navigation would profoundly shape the style, structure, function, and concept of nautical texts. In reaching readers beyond the milieu of pilots and mariners, however, the initial pragmatic purpose of such rutters would be enriched with new meanings. Some of these readers even became rutter translators, editors, and writers, further contributing to the dissemination of such texts.

This chapter has aimed to clarify the widespread circulation of oceanic rutters through the lenses of text-making processes and practices of collecting. Oceanic rutter-writing involved collaborative and systematic effort, culminating in the production and fruition of a global form of knowledge. As Emanuele Kanceff has commented, “The voyage does not exist when

82 Many examples could be given. A comprehensive investigation can be made by starting with Luana Giurgevich and Henrique Leitão, *Clavis bibliothecarum. Catálogos e inventários de livrarias de instituições religiosas em Portugal até 1834* (Lisboa: Secretariado Nacional para os Bens Culturais da Igreja, 2016).

83 The understanding of ocean tides in the thirteenth and fourteenth centuries can be traced back to the Atlantic European coast pilot books, as noted by José Manuel Malhão Pereira, “Roteiros portugueses, séculos XVI a XVIII,” 31. A synthesis of the discussions on the development of oceanic rutters from various ancient and medieval genres can be found in Taveira, “Os roteiros portugueses do Atlântico.”

there is nobody who reads it" ("Il viaggio non esiste se non c'è qualcuno che lo legge"),⁸⁴ a statement accurately capturing the dual impact of reading and traveling on the cultivation of novel collective perception of the world. Perhaps this is nowhere truer for the early modern period than in the case of oceanic rutters.

Acknowledgments

The RUTTER project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 Research and Innovation Programme (grant agreement no. 833438) and from the Fundação para a Ciência e a Tecnologia, I.P./MCTES (PIDDAC): UIDB/00286/2020 and UIDP/00286/2020. In addition to these institutional acknowledgments, I would like to personally thank my colleagues at the RUTTER Project, especially Professors Henrique Leitão and Silvana Munzi, for their precious suggestions. I am also grateful to Samuel Gessner and all the members of the CIUHCT Journal Club (reading group), who were the first to read this chapter and provided me with valuable feedback.

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84 Emanuele Kanceff, "Il viaggio e le sue letture: prolegomeni a un discorso di metodo," in *Questioni odeporiche. Modelli e momenti del viaggio adriatico*, ed. Giovanna Scianatico and Raffaele Ruggiero (Bari: Palomar, 2007), 65–76 (especially 65).

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2. Sixteenth-Century Nautical Treatises: The Definition of a New Genre of Technical Literature

Carmo Lacerda

Abstract: In the sixteenth century, Iberian crews undertook an increasing number of long-distance maritime voyages, leading to a need to preserve and disseminate navigational knowledge. Written texts became essential for codifying this information, birthing a new genre of maritime literature: nautical treatises. Early works like the Munich and Évora Nautical Guides (ca. 1509–1519) integrated practical navigation with cosmographic knowledge, establishing a foundation for future manuals. Their widespread circulation and translation promoted the sharing of Iberian navigational expertise across Europe, influencing navigation manuals in France, England, and the Netherlands. This chapter examines the emergence of nautical treatises and their significant impact on maritime knowledge and their role in transforming navigation into a disciplined science.

Keywords: nautical treatises and guides, cosmography, the art of navigation, oceanic navigation, Iberian Peninsula, Francisco Faleiro.

Introduction

In 1606, over a century after oceanic navigation began, the well-known Spanish cosmographer Andrés García de Céspedes (1560–1611) published his *Regimiento de navegación*. In this book, he compares a ship guided by an uninformed pilot to a blind person using a cane. They might find their way sometimes, but they are just as likely to run into things, like the backside of a horse. Similarly, a poorly navigated ship without the right instruments can

easily run aground or crash into rocks. With that in mind, Céspedes warns against settling for “a substandard level of knowledge or equipment”—both human lives, and valuable cargo, are at stake.¹

The well-being of people, material goods, and the empire itself depended on proper navigation.² Sailing was no mere adventure, and reaching a destination safely demanded discipline, use of the right techniques, and an eye for precision. Unlike navigating the Mediterranean or coastal waters, the inability to accurately determine a ship’s position while sailing across the open ocean for long stretches could be deadly.

At the beginning of the sixteenth century in the Iberian Peninsula, the increasing number of voyages and individuals engaged in navigation created an urgent need to share the practical knowledge thus far acquired about oceanic navigation, in order to train new pilots and sailors in the complex procedures required for these voyages. To this end, new institutions were established to regulate, organize, and disseminate such information, such as the Casa da Índia in Lisbon and the Casa de la Contratación in Seville. Additionally, new roles like *piloto mayor* and *cosmógrafo-mor* were introduced, along with innovative methods for organizing information, including the *padrón real* (master chart). Alongside these efforts, various initiatives emerged to formalize navigation practices, which naturally led to the development of new genres of technical literature.³ Indeed, Pedro de Medina (1493–1567), an influential cosmographer serving the Casa de la Contratación, begins his *Arte de navegar* (1545)—one of the most important works of the first half of the sixteenth century—by attributing

1 “las cosas poco mas o menos, porque en este negocio no va menos que las vidas, y mucha hacienda.” Andrés García de Céspedes, *Regimiento de navegacion q[ue] mando haser El Rei nuestro Señor por orden de su Consejo Real de las Indias a Andres Garcia de Cespedes su cosmografo maior siendo Presidente en el dicho Consejo el conde de Lemos* (Madrid: Juan de la Cuesta, 1606), “Al Lector.”

2 The concern for human lives on board and for the products being transported was a constant at this time, given the risks involved in oceanic navigation. Alonso de Chaves echoes such sentiments when explaining the practice of sounding: “En la mar este instrumento es de muy gran provecho porque nos descubre las celadas y engaños encubiertos, que muchas veces nos roban las haciendas y las vidas, porque están encubiertos debajo del agua, no los vemos hasta estar caídos en los lazos que nos están puestos para nuestra perdición [...]” (At sea, this instrument is of great use because it reveals to us the hidden traps and deceits that often rob us of our possessions and our lives. Because they are concealed beneath the water, we do not see them until we have fallen into the snares that are set for our ruin [...]) Alonso de Chaves, “Quatri partitu en cosmographia pratica y por otro nombre llamado espejo de navegantes” (1528), f. 22r–22v.

3 Henrique Leitão and Antonio Sánchez, “Zilsel’s Thesis, Maritime Culture, and Iberian Science in Early Modern Europe,” *Journal of the History of Ideas* 78, no. 2 (2017): 191–210.

the incompetence of “those who sail” to a deficit of proper instruction and a lack of books providing the relevant education.⁴

The teaching and examination of pilots in Spain were the responsibility of the *piloto mayor* since the position was first created in 1508. Initially, the *piloto mayor* taught the theoretical fundamentals of oceanic navigation in his own home. However, in 1552, with the creation of the chair of cosmography at the Casa de la Contratación, the responsibility for training pilots shifted to the individual holding that position. A royal decree issued in 1527 to *Piloto Mayor* Sebastián Caboto (1476–1557) highlights the rigorous demands placed on pilots aspiring to navigate the routes to the Spanish Indies:

Anyone aspiring to become a pilot must demonstrate, with witness testimony, that they have navigated for six years in the Indies, having traveled to Tierra Firme, New Spain, Española, and Cuba. They must possess a chart and be capable of marking the ship's position, detailing headings, lands, and the most dangerous ports and shallows. Additionally, they should be able to outline the precautions that must be taken and identify locations where essential supplies like water, wood, and other necessities can be obtained. They are also required to have an astrolabe to measure the sun's altitude and a quadrant for locating the North Star, as well as the knowledge to effectively use both instruments. Furthermore, they should understand how to determine and apply the sun's declination, along with the rising and setting of stars, and be able to tell the time during both day and night.⁵

4 “The second thing, Most Serene Lord, that has moved me to this was that I have often remembered how many times I have considered how many people sail, and that not only the known parts, but the very remote and distant that there is no news of, they try to sail, seeking and knowing; and seeing how long and dangerous sea routes are sailed and that few of those who sail know what is required for navigation. The reason is because there are no teachers to teach it, nor books where they can read it.” (“Lo segundo, Sereníssimo Señor, que a esto me há movido fue que yo muchas vezes he puesto memoria en considerar quán gran número de gentes navegan, y que no solamente las partes notas y sabidas, mas las muy remotas y apartadas y que d'ellas no ay noticia, se procuran navegando buscar y saber; y viendo quán largos y peligrosos caminos por la mar se hazen y que pocos de los que navegan saben lo que a la navegación se requiere. La causa es porque ni ay maestros que lo enseñen, ni libros en que lo lean.”) Pedro de Medina, *Arte de navegar en que se contienen todas las reglas, declaraciones, secretos, y avisos, que a la buena navegaciõ son necesarios, y se deven saber, hecha por el Maestro Pedro de Medina* (Valladolid: Francisco Fernandez de Cordova, 1545), Prologue, f. 2r–2v.

5 “Cualquiera que quisiese ser piloto probase por testigos, si había navegado seis años a las Indias, si había estado en Tierra Firme, y Nueva España, y la Española, y Cuba, y que tuviese su carta de marear y supiese echar punto en ella, y dar razón de los rumbos, y tierras, y de los puertos, y bajos mas peligrosos, y de los resguardos que se deben dar, y de los lugares donde se

In Portugal, the formal establishment of nautical education came later, although there had been informal practices beforehand. In 1547, the position of chief cosmographer was established and awarded to the cosmographer and mathematician Pedro Nunes (1502–1578). This role was associated with the Armazéns da Guiné e Índias, the Portuguese institution responsible for navigational matters.⁶ In 1592, King Philip II issued directives in the Regiment of the Chief Cosmographer, mandating that lessons be provided for aspiring officers and members of the nobility serving on royal ships.⁷

This document clearly outlines the curriculum for mathematical instruction, which the chief cosmographer was expected to deliver for one hour each day. Subjects included the sphere and its circles; the movements of the sun, moon, and major celestial bodies; principles of lunar and tidal knowledge; techniques for creating and utilizing nautical charts; the use of the nautical astrolabe for solar observation and determining latitude at noon; the application of the quadrant and cross-staff for finding latitude using the North Star, along with methods for determining latitude by that star; and finally, the determination of magnetic variation and the use of sundials.⁸

Given the structure of pilots' education in the Iberian Peninsula during this period, Medina's complaint, quoted above, is understandable, as

podían abastecer de agua, leña, y de las otras cosas, en tales viajes necesarias. Que tuviese un astrolabio, para tomar la altura del sol, y cuadrante, para el norte, y supiese el uso de entrambas cosas, así en el tomar altura como en el añadir, o quitar la declinación del Sol, y lo que la estrella alza, y baja, juntamente con el conocimiento de las horas que son en cualquier tiempo del día, y de la noche." AGI, Patronato, 251, R.22. Cited in Antonio Sánchez Martínez, "Los artífices del Plus Ultra: pilotos, cartógrafos y cosmógrafos en la Casa de la Contratación de Sevilla durante el siglo XVI," *Hispania* 70, no. 236 (December 30, 2010): 629–630; and in Antonio Sánchez Martínez, *La espada, la cruz y el Padrón: Soberanía, fe y representación cartográfica en el mundo ibérico bajo la Monarquía Hispánica, 1503–1598* (Madrid: Consejo Superior de Investigaciones Científicas, 2013), 126–127.

6 Avelino Teixeira da Mota, "Some Notes on the Organization of Hydrographical Services in Portugal before the Beginning of the Nineteenth Century," *Imago Mundi* 28 (1976): 51–60.

7 Codex in Ajuda National Library, shelf mark 44/XIII/56, pp. 188 to 196v. This regiment dates from 1592, although there is evidence that it is an update of an earlier version, from 1559. For a more detailed analysis of this document and its contents, see Avelino Teixeira da Mota, *Os regimentos do Cosmógrafo-Mor de 1559 e 1592 e as origens do ensino náutico em Portugal* (Lisboa: Junta de Investigações do Ultramar, 1969).

8 It is noteworthy that, despite the fact that the mathematical instruction covered a substantial amount of material that is also present in nautical treatises, there is a certain disconnect between what was taught to the pilots and the topics on which they were examined. In the lessons provided by the chief cosmographer, emphasis was placed on topics more associated with cosmography and astronomical navigation, while the pilots' examinations focused more on practical matters. Teixeira da Mota, "Os regimentos do Cosmógrafo-Mor," 43.

the training of most pilots serving the empire relied heavily on a single individual.

Medina's second protest is that there were no navigation books available to pilots, positioning his work as the first in this category. While it is true that *Arte de navegar* had undeniable importance in nautical literature, it is not accurate to say there were no resources available for training pilots in oceanic navigation at the time. In fact, both Portugal and Spain had already produced works aimed at this purpose, marking the start of a new genre of technical literature in the Iberian Peninsula—nautical treatises.

It is crucial to note that most nautical literature from this period existed in manuscript form. Many of these works, often loose documents with navigational directions and notes, have unfortunately been lost. Some, however, were compiled into “books of seamanship” or other collections and have survived. Notable examples include João de Lisboa's *Livro de marinharia*, which includes his well-known *Tratado da agulha de marear* (“Treatise on the Sea Needle”), and Alonso de Chaves's *Quatri partitu*.⁹ Printed books were almost an exception to the norms of information transmission, yet they had the advantage of reaching a larger number of people.

Several nautical treatises were printed during the sixteenth century. They were mostly written by cosmographers and codified existing knowledge on oceanic navigation. They aimed, according to their authors, to help pilots and sailors acquire a basis for oceanic navigation, acquainting them with cosmography and astronomy (topics with which these practical men generally had little contact).

9 About the *Livro de marinharia* de João de Lisboa, see the edition coordinated by Jacinto Brito Rebello: João de Lisboa, *Livro de marinharia, Tratado da agulha de marear de João de Lisboa. Roteiros, sondas e outros conhecimentos relativos à Navegação*, ed. Jacinto Ignacio Brito Rebello (Lisban: Imprenss Libanio da Silva, 1903). See also João de Lisboa, “O ‘Tratado da agulha de marear’ de João de Lisboa. Reconstituição do seu texto, seguida de uma versão francesa com anotações,” ed. by Luís de Albuquerque, *Junta de Investigações Científicas do Ultramar* (1982): 129–162. On the *Quatri partitu* of Alonso de Chaves see Ursula Lamb, “The *Quatri partitu en cosmographia* by Alonso de Chaves: An Interpretation,” in , *Cosmographers and Pilots of the Spanish Maritime Empire* (Aldershot: Variorum, 1995), II; Maravillas Aguiar, “*Quatri partitu en cosmographia practica i por otro nombre llamado Espejo de navegantes* by Alonso de Chaves: A Navigation Manual for the Instruction of Spanish Pilots in the Sixteenth Century,” in *Ships, Saints and Sealore: Cultural Heritage and Ethnography of the Mediterranean and the Red Sea*, ed. Dionisius A. Agius and Timmy Gambin (Oxford: Archeopress Archaeology, 2014), 41–60; Sánchez Martínez, *La espada, la cruz y el Padrón*, 216–222; and also Alonso de Chaves, *Quatri partitu en cosmografia practica y por otro nombre espejo de navegantes*, ed. Paulino Castañeda Delgado, Mariano Cuesta Domingo, and Pilar Hernández Aparicio (Madrid: Instituto de Historia y Cultura Naval, 1983), 15–65.

The purpose of this chapter is to explore the emergence and development of this new type of literature, showing its relevance and impact on the sixteenth-century European technical literary framework.

2.1. The Nautical Guides of Munich and Évora: Beginnings

Around 1509, a sixty-four-page unnumbered leaflet was published in Portugal with the title *Regimento do estrolabio e do quadrante pera saber ha declinação e ho logar do soll em cada um dia e asy pera saber ha estrella do norte* (“The Regiment of the Astrolabe and the Quadrant to Determine the Declination and Position of the Sun on Any Given Day and to Identify the North Star”).¹⁰ The publisher was Hermão de Campos, one of the most reputable printers in Lisbon at that time. However, no information exists regarding the author or compiler of this work.¹¹ Only two known copies of the publication survive today—one in the Bavarian State Library¹² and the other in the Vatican Apostolic Library.¹³

The book is divided into two parts. The previously mentioned title corresponds to the first part of the work, which contains regiments and instructions for navigators. The second part is entitled *Tractado da spera do mundo tyrada de latin em liguoaagem com ha carta que um gramde doutor aleman mandou ao rey de portugall dom Joham el segundo* (“Treatise on the Sphere of the World Taken from Latin into the Vernacular, with the Letter That a Great German Scholar Sent to the King of Portugal, Dom João II”). This second part is likely the first vernacular version of Sacrobosco’s *Treatise on the Sphere* known in Europe.

10 A “regiment” (*regimento*) is a set of rules or instructions that must be followed to accomplish a certain action.

11 Hermão de Campos, a German, arrived in Lisbon in 1509 and there are known works printed by him until ca. 1518. Besides the Munich Guide, he printed other scientific works such as the *Reportório dos tempos*; *Consideracion astronomica de la maxima conjuncion*; *Arte menor de arimetica, y modo de formar campos*; *Examen de ingenios para las sciencias*; *Tractatus cessante causa cessant effectus*; some medicine titles. He also published editions of laws and regulations of Portugal.

12 *Regimento do estrolabio y do quadrante pera haber ha declinaçam y logar do soll em cada huum dia* (ca. 1510), Bayerische Staatsbibliothek [BS], Rar. 204 (B3Kat-ID: BV001474468). A digitization of Bensaúde’s facsimile edition is available from the Internet Archive at this link: <https://archive.org/details/regimentodoestroobens>. Recent searchable edition: Zenodo, 2023. <https://doi.org/10.5281/zenodo.8379665>

13 *Regiment of the estrolabio [et] of the quadrant ...* (ca. 1500–1510?), Vatican Apostolic Library [BAV], Stamp.Ross.653.

Approximately ten years later, around 1519, a very similar work was published by Germão Galharde's printing house in Lisbon.¹⁴ The title on the frontispiece reads *Tractado da Spera do mundo tirada de latim em lingoagem portugues com huma carta que um grande doutor Aleman mandou a el Rey de Portugal dom Joam ho segundo* ("Treatise on the Sphere of the World Translated from Latin into Portuguese with the Letter that a Great German Scholar Sent to the King of Portugal, Dom João II"). This work, spanning seventy-two unnumbered pages, is also divided into two parts, with the title of the second part being *Segue-se ho regimento da declinaçam do sol pera per ella saber ho mareante em qual parte está, a saber, aquem ou alem da linea equinocial. Com ho regimento da estrela do norte* ("Following is the Regiment of the Declination of the Sun, so that the Sailor Can Determine His Position, Namely, on This Side or beyond the Equinoctial Line, with the Regiment of the North Star"). The author or compiler of this work remains unknown, and only one copy is known to exist today, preserved in the Public Library of Évora.¹⁵

These two small publications from the early sixteenth century are considered to be the first printed works intended to assist pilots in oceanic navigation and are the oldest known Portuguese nautical guides.¹⁶ The

14 Germão Galharde (or German Gaillard) was a French printer who settled in Lisbon in 1519 and also worked in Coimbra. He used the printing materials that had belonged to Valentim Fernandes (? –1519), a German printer who had established himself in Lisbon and became a key figure in the Portuguese printing industry. Besides many editions of laws and regulations of Portugal and religious works, he also printed scientific works such as *Reportório dos tempos*, Pedro Nunes's *Tratado da esfera*, Gaspar Nicolás's *Tratado da prática d'arismética*, Ruy Mendez's *Prática darismetica*, Dionísio Areopagita's *Dialogus circa quasdam questiones in medicina*, a commentary on Pliny by Martinho de Figueiredo, João de Barros's *Décadas da Ásia*, and some chronicles.

15 *Tratado da esfera* (ca. 1516–1524?), Évora Public Library [BPE], BPE-RES Res. 0404. Digitized work available as PDF at this link: <https://purl.pt/27101/1/index.html>. Recent searchable edition: Zenodo, 2023. <https://doi.org/10.5281/zenodo.8367561>.

16 The Portuguese historian of maritime expansion, Luís de Albuquerque, published a modern edition of these works and studied them in detail, naming them according to their locations: *Guia náutico de Munique* (Munich Guide) for the 1509 publication and *Guia náutico de Évora* (Évora Guide) for the 1519 edition. This terminology will be used throughout this chapter. The discussion of the dating of the two leaflets is present in Albuquerque's work: ca. 1509 for the Munich Guide and ca. 1516 for the Évora Guide. No firm consensus on their date of composition exists, however; Jorge Semedo de Matos, for example, considers the Évora Guide to have been written between 1520 and 1524, see Jorge Semedo de Matos, "Tábuas solares na náutica portuguesa dos séculos XV e XVI," in *D'Aquém, d'Além e d'Ultramar: Homenagem a António Dias Farinha*, eds. Francisco Contente Domingues, José da Silva Horta, and Paulo David Vicente (Lisboa: Centro de História da Faculdade de Letras da Universidade de Lisboa, 2015), II:1235–1250. In fact, the printer of the Évora Guide, Germão Galharde, only settled in Lisbon in 1519, which means it is

simplicity and compact format of the publications, the use of the vernacular language, and the translation of *The Sphere* suggest that these works were aimed at individuals with limited formal education, such as pilots, and were possibly intended to be brought on board. According to Eva Taylor, these publications established the standard for nautical manuals in Portugal.¹⁷

From the titles, one can discern the two fundamental components present in both the Munich and Évora Guides: one part dedicated to regiments and practical instructions for navigation, and another focused on the sphere, or the fundamentals of cosmography. The titles also reveal similarities between the two publications, which, at first glance, appear to be two editions of the same work, with the order of the contents reversed in the second edition.¹⁸ In fact, the section on the sphere is identical in both cases. However, this is not true for the other section—the navigation regiments—which differs substantially. Therefore, despite certain striking similarities, it is not evident that the two leaflets are simply two versions of the same text.

The two works likewise share features in their visual presentation, starting with the frontispieces. In the Munich Guide, both the regiments and the section on the sphere are preceded by a folio featuring an armillary sphere. In the Évora Guide, there are slight variations: while the frontispiece of the section on the sphere also displays a large armillary sphere, two human figures, one on each side, have been added. One figure holds a crown and scepter (likely representing Afonso X), while on the other side, a man holds a book and points to a circular diagram within it (probably a depiction of Ptolemy).

The frontispiece of the second section (focused on the regiments) is decorated with an elaborate frame that contains a human figure holding a book, set against a background of a star and a sphere. To his right is an armillary sphere, and at the bottom of the frame, the publisher's mark of Germão Galharde is visible. In both Guides, there are thirty-two identical diagrams in the section on the sphere, one additional diagram in the regiments section, and a set of tables concluding this section.

impossible that the work is from 1516. In any case, it seems likely that both works were written and printed in the early decades of the sixteenth century. For the purposes of this chapter, ca. 1509 will be adopted for the Munich Guide and ca. 1519 for the Évora Guide.

17 Roger Barlow, *A Brief Summe of Geographie*, ed. E. G. R. Taylor, Works Issued by the Hakluyt Society, Ser. 2, 69 (London: Hakluyt Society, 1932; repr., Farnham: Ashgate, 2010), xv.

18 This is the opinion of Luís de Albuquerque, who argues that the two leaflets are distinct editions of the same work, the Évora Guide constituting an improved version of the Munich Guide: Luís de Albuquerque, ed., *Os guias náuticos de Munique e Évora* (Lisboa: Junta de Investigações do Ultramar, 1965), 7–8.



Figure 2.1. Frontispiece of the Munich Nautical Guide, Lisboa, 1509



Figure 2.2. Frontispiece of Évora Nautical Guide, Lisboa, 1519

These publications are innovative for several reasons. First, they mark the first time that navigation regiments for pilots were printed and made publicly available. The appearance of such texts in print reflects not only the new demands of oceanic navigation but also the specific knowledge that pilots needed to navigate the ocean without any references. These regiments provided basic procedures for performing the astronomical operations essential to this new form of sailing, such as calculating the altitude and declination of the sun, measuring the altitude of the North Star, and understanding the relationship between degrees and leagues, among other skills.

These computations and measurements served a fundamental purpose in long-distance navigation: determining the ship's position by calculating both course and latitude. Latitude could be determined by measuring the altitude of the North Star using instruments like the astrolabe, quadrant, or cross-staff, or by measuring the sun's altitude. For calculations based on the sun's position, it was necessary to consider the sun's declination on that specific day, information provided by solar declination tables prepared before a voyage.¹⁹

The regiments are written in succinct and straightforward language, devoid of complex definitions or explanations of phenomena. They consist of clear, practical, and objective steps to be taken (much like those found in a recipe book), and instructions are delivered in the form of direct commands, as if the author is giving orders. This reinforces the practical nature of the work, which was obviously not intended to remain on a shelf for scholarly study. The absence of any paratextual elements further emphasizes such a role. To illustrate this, let us examine the beginning of the sun regiment in the Munich Guide:

If you want to know, wherever you are, how much you are away from the equinoctial line, and whether you are below or beyond or under, by the height of the sun; know that it is necessary that you first take the height of the sun with an astrolabe or quadrant, and this at noon, when the sun is at its steepest. Once you know the height, keep it. And enter in this table the height of that month and day; and you will find on that day in what degree the sun is and how much declination it has then.²⁰

19 The presence of astronomical tables, namely of solar declination, is indicative of the practical purpose of the work.

20 "Se tu quiseses saber, em qualquer parte em que estiveres, quanto é aquilo que estás afastado da linha equinocial, e se estás aquém ou além ou debaixo, pela altura do Sol; sabe que é necessário

To carry out the calculations described, solar declination tables were necessary, and in both guides, these are placed after the regiments, using Arabic numerals. In the Munich Guide, there are twelve tables, corresponding to the twelve months of the year. For each day of the month, the tables include a column for the saint assigned to that day, another for the sun's position, and two more columns for the sun's declination (in degrees and minutes).

The tables in the Évora Guide show some differences that indicate they were improved to better serve the practical purposes of the work. While the Munich Guide tables are calculated for just one year, the Évora Guide contains the first known printed quadrennial tables. One-year tables were calculated using rough approximations, and could often be used for more than one year with only minimal adjustments. The variations would not be very significant, usually affecting only the minutes. However, the results would not be as accurate as those obtained from quadrennial tables, which had to be renewed after each cycle.²¹

In the Évora Guide, the table layout for the first year is similar to that of the Munich tables, but from the second year onwards, the columns for the saint of the day and the sun's position are removed. The improvements evident in the Évora Guide are clear both at a technical and typographical level, reflecting a more advanced stage in the evolution of nautical knowledge.²²

Regarding the content of the regiment section in the Munich Guide, first comes the regiment of the sun (that is, the rules for knowing the height of the sun, its declination, and from that calculating the latitude, followed by the regiment of the Pole Star (or regiment of the north, with the rules for calculating the height of the North Star and thus the latitude). Next, the Munich Guide provides a list of the heights of the equinoctial. At the end, before the tables, there is a small section containing the regiment of the leagues (the equivalence between degrees and leagues). The regiment section in Évora Guide is more complete. Besides the regiments of the sun, Pole Star and leagues, it is supplemented with instructions for determining

que tomes primeiro a altura do Sol com astrolábio ou quadrante, e isto ao meio-dia, quando o Sol está mais empinado. A qual altura sabida, guarda-a. E entra em esta tabuada em direito daquele mês e daquele dia; e acharás em aquele dia em que grau está o Sol e quanto tem então de declinação." Joaquim Bensaúde, *Opera omnia*, vol. IV (Lisboa: Academia Portuguesa da História, 1995), 48. (Bensaúde's work is cited here as it contains a facsimile edition of the original edition of *Guias náuticos*, and the advantage is that in Bensaúde's work they are numbered, which is not the case in the original copies.)

²¹ Albuquerque, *Os guias náuticos de Munique e Évora*, 75.

²² Albuquerque, *Os guias náuticos de Munique e Évora*, 76.

the hour of night by means of the Pole Star. The list of altitudes is also more complete, and a new rule for the tides was added at the end.

As for the cosmographical section (which appears second in the Munich Guide and first in the Évora Guide), the version of the *Treatise on the Sphere* printed in both is quite faithful to Sacrobosco's text. It maintains the original order and includes the diagrams that were common in versions of the *Sphere* circulating at the time. The text is divided into four chapters, but unlike other versions, such as those by Francisco Faleiro or Pedro Nunes, it lacks the subdivision of each chapter into various sections with titles. This absence makes it more difficult to identify the different subjects within the continuous text.

There are also some omissions and minor alterations to Sacrobosco's text, mostly in sections that were not essential for sailors. Additionally, there are certain inconsistencies between the section on the sphere and the other texts (regiments) in the Guides. These inconsistencies led Luís de Albuquerque to suggest that the various parts of the work were likely written separately.²³

The excerpt presented above, from the regiment of the sun in the Munich Guide, addresses concepts such as "equinoctial line" and "height of the Sun." It is not immediately apparent that these concepts, which were common in fields like astronomy and cosmography, were fully understood by pilots and navigators in the early days of oceanic navigation. The authors or compilers of the nautical guides recognized this issue early on: to properly understand the regiments, a certain precision in the definition of the concepts used was necessary.²⁴ The vernacular translation of Sacrobosco's *Sphere* in the nautical guides, therefore, represents a completely innovative (and perhaps unexpected) element in the nautical literature of the time, seeking to address this challenge.

Sacrobosco's *Treatise on the Sphere* was written and circulated for the first time in the thirteenth century and was widely disseminated throughout Europe during the medieval period, serving as the reference work for teaching the basics of cosmography.²⁵ For almost three centuries, this work was

23 Albuquerque, *Os guias náuticos de Munique e Évora*, 85–86.

24 It is interesting to note that the order of the contents in the Évora Guide was reversed: the first part refers to the sphere and the second to the regiments and tables. If one had to be familiar with the concepts appearing in the regiments to understand them well, then it was better for the cosmography part to appear first, providing the basis for understanding.

25 Owen Gingerich, "Sacrobosco as a Textbook," *Journal for the History of Astronomy* 19, no. 4 (November 1988): 269–273; Matteo Valleriani, ed., *De sphaera of Johannes de Sacrobosco in the Early Modern Period: The Authors of the Commentaries* (Cham: Springer Open, 2020); Matteo

read exclusively in Latin. Since its target audience was primarily university intellectuals, no translation was necessary.

The fact that the Munich Guide contains the earliest vernacular edition of Sacrobosco's *Sphere* published in Europe suggests that, most likely, this was the first time the work was used outside the university context, specifically in the field of navigation. This highlights a new need among a specific social group (pilots and seamen) in a specific country (Portugal) for the content of a cosmographical text that had previously been inaccessible to them. As part of a broader set of disciplines cultivated and developed among the literate, cosmography required training that this group had lacked.

In medieval nautical literature, it was uncommon to find content like that found in the Nautical Guides. Since medieval navigation was primarily coastal, the information in nautical texts focused more on tides, seabeds, currents, routes, and directions to ports.²⁶ However, with the onset of long-distance voyages, sailing techniques began to evolve, incorporating astronomical methods to calculate the ship's position on the high seas. Technical literature had to adapt to these changes, furnishing pilots with the necessary instructions to carry out astronomical observations and measurements—skills not required in coastal navigation.

Cosmography, therefore, provided pilots and sailors with the foundational knowledge needed to make these measurements and calculate latitude on the open ocean. But cosmography had a broader role. The shift to global navigation made it more difficult for sailors to control their spatial orientation, as the vast ocean offered no physical points of reference, unlike the Mediterranean. Thus, cosmography came to offer a new mental framework, transmitting the theoretical references that helped pilots navigate and understand the immense spaces they were crossing.

Furthermore, cosmography addressed the growing need for a common language, which had previously been absent in oceanic navigation. It probably facilitated communication both aboard ships, between pilots and

Valleriani, "The Tracts on the Sphere: Knowledge Restructured Over a Network," in *The Structures of Practical Knowledge*, ed. Matteo Valleriani (Cham: Springer International Publishing, 2017), 421–473.3; Kathleen Crowther et al., "The Book Everybody Read: Vernacular Translations of Sacrobosco's *Sphere* in the Sixteenth Century," *Journal for the History of Astronomy* 46, no. 1 (February 2015): 4–28; Richard J. Oosterhoff, "A Book, a Pen, and the Sphere: Reading Sacrobosco in the Renaissance," in *History of Universities*, ed. Mordechai Feingold (Oxford: Oxford University Press, 2015), XXVIII/2:1–54.

26 See Luís de Albuquerque, *Introdução à História dos Descobrimentos Portugueses*, 3rd ed. (Mem Martins: Publicações Europa-América, 1986) and E. G. R. Taylor, *The Haven-Finding Art: A History of Navigation from Odysseus to Captain Cook*, new augmented ed. (London: Hollis and Carter for the Institute of Navigation, 1971).

sailors, and on land, between pilots and cosmographers, as well as between sailors, merchants, administrative officials, and military personnel. With the increasing need for cooperation between these different social groups, cosmography played a crucial role in creating a shared vocabulary. If pilots, with their practical knowledge, became familiar with the basic concepts of cosmography, the exchange of information between these groups would be much easier. The effort to bridge this gap is evident in the nautical guides, where an attempt was made to adapt theoretical content to the practical needs of sailors, ensuring the transmission of knowledge and the development of a common linguistic code.

There was certainly a wide circulation of these publications, although only three copies are known to have survived to the present day.²⁷ For instance, we know that the solar declination tables from the Munich Guide were reproduced in a manuscript attributed to the *Book of Francisco Rodrigues* (1511–1515). This indicates that the nautical guides reached at least as far as India and the Far East, playing an important role in the training of qualified pilots like Francisco Rodrigues.²⁸

One consequence of the broad circulation of the Munich and Évora nautical guides was their significant impact on European technical and nautical literature, influencing several major subsequent works in the field, including Enciso's *Suma de geographia* in Spain, Roger Barlow's *A Brief Summe of Geographie* in England, and Fontaneau's *La Cosmographie, avec l'esphère et le règne du Soleil et du Nord* in France. It is to these works, in which the impact of the nautical guides is unmistakable, that we now turn.

Martín Fernández de Enciso's *Suma de geographia* (1519) was published in Seville by Jacobo Cromberger.²⁹ As indicated by the title, Enciso dedicates

27 It is known that small books are more susceptible to loss and destruction than large books. Probably, in addition to the nautical guides, other books and pamphlets with similar content circulated among pilots, in manuscript, which have not reached us.

28 Semedo de Matos, "Tábuas solares na náutica portuguesa dos séculos XV e XVI," 14. Francisco Rodrigues was a Portuguese pilot and the main cartographer to accompany Afonso de Albuquerque. He was likely chief pilot of the fleet that explored the seas of Indonesia between 1511 and 1512, led by Antonio de Abreu and ordered by Afonso de Albuquerque, with the aim of reaching the Moluccas. Rodrigues also passed through places like India and Ethiopia and he prepared records and rutters of his various voyages that are compiled in the *Book of Francisco Rodrigues*. For more information about this work see *O livro de Francisco Rodrigues: O primeiro Atlas do Mundo Moderno*, ed. José Manuel Garcia, 1st ed. (Porto: Editora da Universidade do Porto, 2008).

29 Full title: *Suma de geographia que trata de todas las partidas e provincias del mundo: en especial de las indias. E trata largamente del arte del marear: junto con la espera en romãce: con el regimiento del sol e del norte: nuevamente hecha* ("A Sum of Geography that Treats of All the Parts and Provinces of the World: Especially of the Indies. And Deals Largely with the Art of

most of his work to the geographical description of the world (about a hundred folios). The *Suma* begins with a section on the sphere, followed by tables of solar declination, the regiment of the North Star, and the regiments for the astrolabe and quadrant. This entire first part occupies only around forty folios of the 150 that make up the work, which is not divided into chapters.

Enciso's cosmographic section is brief and does not present major innovations—unlike the geographical part, where he offers, for the first time, a description of the New World. This description enjoyed widespread credibility throughout the century as it was based on the author's own experience.³⁰ While the *Suma* was the first manual of its kind in Spain to combine the sphere with the art of navigation, it should be noted that this is not the most significant aspect of the work. The structure of the cosmographic section was already present in the nautical guides of Munich and Évora.

The regiment of leagues in Enciso's *Suma de geographia* largely reproduces the numbers from the Évora Guide, and the values in the regiment of the Pole Star also correspond to those found in the nautical guides, although abbreviated. The regiment on the sun's declination is similarly a direct copy from the Munich Guide, albeit with some variations. The parts of Enciso's work that are identical to those in the nautical guides suggest that Enciso used them as a source for his *Suma de geographia*.³¹ However, the divergent values in the solar declination tables indicate that he also availed himself of other reference materials.

In 1540/41, Roger Barlow wrote *A Brief Summe of Geographie*, which was not published until 1932 (by Eva Taylor).³² The basic structure of this book included some nautical rules and routes, but the author later expanded it by adding a section on the sphere. The influence of Enciso's work is plain; however, Barlow must have also consulted the nautical guides, since the values of the regiment of leagues and the regiment of the North Star match

Navigation: Together with the Sphere in Romance: with the Regiment of the Sun and the North Star: Newly Made).

30 Antonio Sánchez Martínez, "Cartografía en lengua romance: Las cartas de marear en los regimientos y manuales españoles sobre el arte y la ciencia de navegar," *Boletín de La R.S.G CXLVI* (2010): 169. According to Eva Taylor, the cosmographic part of Enciso's work was translated from André Pires's *Livro de marinharia* (Barlow, *A Brief Summe of Geographie*, xv). Luís de Albuquerque does not share this opinion, as he claims that the compilation of the *Livro de marinharia* by André Pires was made after the publication of the first edition of Enciso's *Suma de geographia*. He concludes that both Enciso and André Pires were based on the same sources. Albuquerque, *Os guias náuticos de Munique e Évora*, 116 (note 60).

31 See some examples in Albuquerque, *Os guias náuticos de Munique e Évora*, 117–118.

32 Barlow, *A Brief Summe of Geographie*.

those of the guides, and the rules for the sun's declination are those found in the Évora Guide, rather than in the *Suma de geographia*.³³ Furthermore, the sun's declination tables in Barlow's work correspond to the quadrennial tables of the Évora Guide.

In the first major French work on seamanship, *La Cosmographie, avec l'esphère et le règne du Soleil et du Nord* (1544/45), by Jean Fontaneau (the Portuguese João Afonso), the influence of the nautical guides is evident as well, particularly in the tables of solar declination. It is also clear that João de Lisboa's work impacted Fontaneau, especially regarding magnetic declination.³⁴

These three works are just a few illustrations of the importance of the Munich and Évora Nautical Guides for early sixteenth-century technical literature—their impact, however, extends well beyond these examples. Such is the case for Francisco Faleiro's *Tratado del esphera*, which will now be analyzed in greater depth.

2.2. Francisco Faleiro's *Tratado del esphera*: Setting the Pattern

In 1535 Francisco Faleiro published the *Tratado del esphera y del arte del marear* in Seville.³⁵ Ten years later, Pedro de Medina complained (in his work *Arte de navegar*) that, despite the large number of people involved in navigation, "there are neither masters who teach this art, nor anyone who has written about how to navigate."³⁶ It is difficult to accept that Medina was unaware of Faleiro's work, especially since they collaborated at the Casa de la Contratación. Therefore, Medina's statement should be interpreted as a rhetorical device—a common tactic in texts of that period—meant to promote his own work. Faleiro's treatise in fact precedes Medina's and did not receive the attention it deserved, either in its time or in subsequent historiography.

Francisco Faleiro was a Portuguese cosmographer who, after assisting in the preparation of Ferdinand Magellan's expedition to the Moluccas, remained in Seville in the service of the Spanish monarch, building a long career as a cosmographer at the Casa de la Contratación.

33 Albuquerque, *Os guias náuticos de Munique e Évora*, 119.

34 Albuquerque, *Os guias náuticos de Munique e Évora*, 124.

35 Francisco Faleiro, *Tratado del esphera y del arte del marear* (Sevilla: Juan Cromberger, 1535).

36 "ni hay maestros que esta arte enseñen, ni de ninguno hay noticia que hasta ahora haya escrito modo de navegar." Medina, *Arte de navegar*, Prologo, f. 2v.

In addition to collaborating on various projects, including the reform of the *padrón real* (the royal navigation chart), Francisco's expertise was frequently sought by the community of cosmographers and pilots on technical and scientific matters. His influence in this field was significant, and his opinions were highly regarded in matters of navigation and cosmography.

Faleiro's most prominent contribution to the field of nautical studies was his *Tratado del esphera y del arte del marear, con el regimiento de las alturas, con algunos reglas nuevamente escritas y muy necessarias* ("Treatise of the Sphere and the Art of Seafaring, with the Regiment of the Heights, with Some Newly Written and Very Necessary Rules"). This 104-page work was published by one of the best printing houses in Spain at that time, belonging to the Cromberger family, with royal privilege, and it had no other edition besides the first.³⁷ The title of the work already gives a glimpse of its content, which combines two worlds: cosmography and the art of navigation. A more detailed analysis of this work's content will help us understand the central role it played in shaping the literary genre of nautical treatises.

The first part of the text, comprising twenty-two chapters, focuses on cosmography. As in the nautical guides, Faleiro includes a version of Sacrobosco's *Sphere*. However, it is not a direct translation, as Faleiro adds his own material and critical comments, distinguishing himself from the role of a mere translator. This is evident in his unique way of explaining concepts, as well as the deliberate additions and omissions he makes to suit the purpose of his work.

In the first three chapters of Faleiro's work, the alignment with Sacrobosco's text is apparent—the two are very similar. However, in other sections, Faleiro takes a distinctive approach to certain topics, such as the properties of the elements, the humors, and the influence of the stars on human life. Additionally, Faleiro does not follow the exact order of subjects presented in Sacrobosco's text. He also expands upon certain topics, such as the division of the earth into five zones, further developing these themes by supplementing Sacrobosco's information with recent data obtained through the discoveries, which contradicted some ancient ideas. Furthermore, the discussion of the timing and revolutions of the spheres—the last chapter in Faleiro's first part—constituted an entirely new section that did not exist in Sacrobosco's work. Faleiro leaves out parts of the *Sphere* he considered extraneous to the aims of his treatise—in chapter 10, on the colures, he states, "As these circles do not serve the purpose of this work, they will

37 On the Crombergers and their work see Clive Griffin, *The Crombergers of Seville: The History of a Printing and Merchant Dynasty* (Oxford: Clarendon Press, 1988).



Figure 2.3. Frontispiece of Francisco Faleiro, *Tratado del esphera*, Sevilla, 1535

not be further discussed.”³⁸ In Faleiro’s text the discourse is presented in a simple and instructional manner, using diagrams and practical examples to clarify the concepts being discussed.

The second part of Faleiro’s *Tratado del esphera* is dedicated to the art of navigation, consisting of nine chapters and a tenth section on numerals. At

³⁸ Faleiro, *Tratado del esphera y del arte del marear*, chap. X.

the beginning of this section, Faleiro offers three chapters on the horizon, a fundamental concept for oceanic navigation. He then provides a chapter entitled, "Very Useful Instruction for Beginners in the Art of Navigation," with guidance for pilots. Finally, he includes regiments already found in the nautical guides, such as those for determining the altitude of the Pole Star, the height of the sun, and converting degrees to leagues.

The eighth chapter of the second part of Faleiro's *Tratado del esphera* is notable for its innovative content, drawing the attention of historians, as it marks the first time that the issue of magnetic declination was addressed in a printed work. Although this phenomenon was already known and circulated in manuscript form, as seen in João de Lisboa's *Tratado da agulha de marear*, its significance for navigation and cartographic representation only became evident with the expansion of oceanic navigation and the concomitant increase in travel scale and distances.³⁹ In this chapter, Faleiro presents four methods to determine and correct the compass needle's error, together with a shadow instrument designed for this purpose.⁴⁰

In the final chapter of the second part, Faleiro explains the use of the quadrennial tables of solar declination, which are given at the end of the book. The inclusion of these tables is not unique to Faleiro's *Tratado*, as they had already appeared in earlier works like the nautical guides and *Suma de geographia*. Faleiro adopts the values proposed by Abraham Zacuto (1452–1515) for the tables, with a maximum declination of $23^{\circ}33'$. However, he omits information on the sun's position and religious holidays, details unnecessary for navigation, providing instead only the day of the month and the sun's declination in degrees and minutes for each day. Faleiro's tables were fully reproduced in the second edition of *Suma de geographia* (1530) and in Pedro de Medina's *Arte de navegar* (1545).

In the final section of the *Tratado*, Faleiro includes a brief section titled "Rules for Quickly Learning How to Count with Numbers," where he explains the use of Arabic numerals. Notably, Portuguese navigation tables, such as the nautical guides and *Reportório dos tempos*, more frequently employed Arabic numerals than Roman numerals, while Spanish authors adopted Arabic numerals more gradually. In Enciso's *Summa*, Roman numerals appear in both editions, whereas Medina's *Arte de navegar* uses both types, with

39 Luís de Albuquerque, "Contribuição das navegações do séc. XVI para o conhecimento do magnetismo terrestre," *Revista da Universidade de Coimbra* XXIV (1970): 5–22; Lisboa, "O 'Tratado da agulha de marear' de João de Lisboa."

40 For an analysis of these four processes and a brief description of the shadow instrument proposed by Faleiro in this chapter see Luís de Albuquerque, *Instrumentos de navegação* (Lisboa: Comissão Nacional para as Comemorações dos Descobrimentos Portugueses, 1988), 73–79.

a preference for Roman. However, in later works, such as Martín Cortés's *Breve compendio de la sphaera* (1551) and Medina's *Regimiento de navegación* (1563), Arabic numerals are more prevalent. Although Faleiro published in Spain, he opted for Arabic numerals, possibly influenced by his Portuguese background, as Roman numerals appear to have remained in use longer in Spain.⁴¹

Faleiro expanded on the structure found in the nautical guides of Munich and Évora, enhancing it and incorporating elements he considered essential for assisting navigators. While the nautical guides already contained cosmography, navigation regiments, and solar declination tables, Faleiro introduced a crucial element: navigation instruments.

Interestingly, although one section of the nautical guides is designated *Regimento do estrolabio e do quadrante* ("Regiment of the Astrolabe and Quadrant"), the astrolabe and quadrant are seldom mentioned explicitly. The instructions focus more on the calculations involved, suggesting that familiarity with these key navigation instruments may have been tacitly assumed to be acquired knowledge among navigators. Faleiro references the astrolabe and quadrant more frequently than the nautical guides but does not provide detailed usage instructions. He places particular emphasis on the compass in chapter 8, where he explains the phenomenon of magnetic declination.

Alongside standard instruments like the astrolabe, cross-staff, and quadrant, Faleiro touches upon new instruments in his work. In chapter 6 of the second part, for example, he proposes a novel "shadow instrument" for measuring the sun's altitude even when it is not exactly noon, addressing the issue of the sun's occasional invisibility. In chapter 8, he describes another

41 For an analysis of the appearance and the diffusion of the Arabic numerals in Portugal see Joaquim Barradas de Carvalho, *Sur l'introduction et la diffusion des chiffres arabes au Portugal* (Lisboa: Livraria Bertrand, 1958). According to this author, the introduction of Arabic numerals in Portugal happened through authors or foreign origin or formation (such as Valentim Fernandes, Martim Behaim, and Hans Mayr), who established themselves in Portugal, attracted by commerce and the navigation underway. Thus, the first Portuguese texts in which the percentage of Arabic numerals is considerably higher than that of Luso-Roman numerals are works by authors involved in navigation and commercial life. The first author born and educated in Portugal to apply a larger amount of Arabic numerals in a text was Duarte Pacheco Pereira (1460–1533), in the *Esmeraldo de situ orbis* (ca. 1505–1508). It is therefore not unreasonable to assume that it was through the influence of Portuguese nautical texts that Arabic numerals were also introduced and spread in the Spanish nautical literature. However, it is known that Arabic numerals appeared at different times depending on the discipline. The use of Arabic numerals in astronomical tables dating back to the fourteenth and fifteenth centuries indicates that astronomy was probably the first to adopt them.

shadow instrument, this time for determining magnetic declination. Faleiro furnishes instructions for constructing and using these instruments and provides an illustration of the instrument for magnetic declination. He then underscores the importance of reliable instruments on board ships.

Compared to the brief and schematic pamphlets format of the nautical guides, Faleiro's text features a much more developed narrative style. He engages with the reader by explaining essential navigation concepts, such as the sun's altitude, shadow, and declination, as well as latitude and longitude, route, course, meridian, parallel, and more. He supplements this material with diagrams and practical examples, and expresses himself in clear, accessible language.⁴²

The use of the vernacular is a key element in this type of literature, as it was aimed at an unschooled audience, as Faleiro notes in the introduction to his *Tratado*. The author explicitly states the purpose of his work, addressing the practical needs of navigation:

And because the main purpose of all this and of the heights is to ensure in this art that the sailors know what they are sailing by their routes and how much navigation they have according to the voyage that each one hopes to make, and that by the height they know the degrees in which are the ports, rivers, capes, cities, berries, bays, straits and the parallel or height in which the ships are every day. And they should know the routes that should be followed to navigate from one to the other and the distances between them, both from the equinoctial and from one to the other.⁴³

42 "[...] I wanted to write this simple treatise in our Castilian language with my rough pen and humble thought, submitting myself to the emendation and correction of better wit, in this crude style, so that those who, like me, do not reach the polished Latinity, to this lack may not fail to know something by natural reason of the admirable works and wonders of God [...]" "[...] quise escrever com mi ruda péñola y humilde pensamiento, sometiéndome a la emienda y corrección de mejor ingenio, este simple tratado en nuestra lengua castellana por este tan tosco estilo, para que los que como yo no alcanen la polida latinidad a esta falta no dexen de saber algo por natural razón de las admirables obras y maravillas de Dios[...]" Faleiro, *Tratado del esphera y del arte del marear*, f. iir–iiv.

43 "E porque el fin principal de todo esto y de las alturas es endereçado en esta arte a que los mareantes sepan lo que por sus derrotas navegan e cuánto tienen de navegación según el viaje que cada uno espera hazer, y que por el altura se sepan los grados en que están los puertos, ríos, cabos, ciudades, bayas, baxos, estrechos y el paralelo o altura en que las naos se hallan cada día. E sabido, sepan las derrotas que conviene seguir para navegar de los unos a los otros e las distancias d'ellos, assí de la equinocial como de los unos a los otros." Faleiro, *Tratado del esphera y del arte del marear*, f. 28v.

It is worth considering why a work of such significance, authored by someone as well-regarded and respected as Faleiro, did not achieve greater impact and distribution. One possible explanation is that shortly after its publication, similar works emerged in Spain that surpassed Faleiro's in various aspects.

2.3. Crossing Boundaries: From the Iberian Peninsula to Europe

In 1545 Pedro de Medina published his *Arte de navegar en que se contienen todas las reglas, declaraciones, secretos, y avisos, que a la buena navegaciõ son necesarios, y se deven saber, hecha por el maestro Pedro de Medina* ("The Art of Navigation in Which Are Contained All the Rules, Declarations, Secrets, and Warnings, Which Are Necessary for Good Navigation, and Which Should Be Known, Made by the Master Pedro de Medina"). The title suggests a broader ambition than that of the nautical guides or Faleiro's *Tratado*. In the nautical guides, the title refers to the treatise on the sphere and the regiments for the sun and the North Star. Faleiro's title, in turn, includes the treatise on the sphere, the regiment of heights, and adds "some rules newly written." Medina, however, aims to present all the rules necessary for effective navigation. Medina's work is thus more extensive than Faleiro's, spanning roughly twice as many folios. It addresses most of the topics covered by Faleiro in greater depth and treats additional subjects as well.

The *Arte de navegar* is divided into eight books. The first book covers the sphere, drawing on Sacrobosco's work, though Medina, like Faleiro, does not reproduce Sacrobosco's text *ipsis verbis*. The second book discusses the sea, its movements, and the origins of navigation, while the third addresses the winds. The fourth and fifth books detail the regiments for determining the altitude of the sun and the Pole Star, respectively; the sixth covers the sea compass and magnetic declination; the seventh discusses the phases of the moon; and the eighth and final book examines the days of the year. Throughout, Medina connects each topic to navigation, in lucid vernacular language.

As has been stated, Medina's work includes topics that Faleiro does not address in his *Tratado*, such as the sea and wind, the moon's phases, and the calendar. Interestingly, while Medina incorporates elements from Faleiro's *Tratado*, such as the solar declination tables, he also diverges from it, particularly on magnetic declination in book 6. Here, Medina introduces the compass as the most essential tool for a navigator, likening it to sight among the human senses. He then outlines six reasons why compasses

might fail to point north (whereas Faleiro identifies only one) and proposes solutions for each of these issues.

Next, Medina clarifies what constitutes east and west and their relationship to the equinoctial line, along with the directions in which the sun rises and sets—valuable information for navigation. In the third chapter of book 6, Medina shares his view on compass variation, which differs from Faleiro's. He states, "In this matter, I have sought some authority, reasoning, or foundation, and I must say that regarding this variation ascribed to the needle, I have found no writings, reasons, or reliable experience to confirm it."⁴⁴ He then outlines the reasons for rejecting the existence of magnetic declination.

In book 6, Medina also introduces a shadow instrument that allows one to check if the compass needle is accurate. This suggests that Medina acknowledges variations in the needle but does not attribute them to magnetic declination. Instead, he considers these variations to be due to imperfections in the needles themselves.

In his work, Medina embraced the well-known idea that a picture is worth a thousand words. From Book III onward, the *Arte de navegar* is richly illustrated, featuring approximately eighty diagrams—sixty-seven of them circular—and a nautical chart. Medina set a new standard for visual content in nautical manuals, far surpassing the number of illustrations in preceding works. The nautical guides of Munich and Évora, for instance, contain only thirty-two diagrams in the section on the sphere and one additional diagram in the section on regiments. Enciso's *Suma* includes no illustrations or diagrams in the sphere section and only two in the regiments section. Faleiro's *Tratado* has ten diagrams in the sphere section, six in the navigation section, and an instrument illustration.

There is a clear progression in the number of illustrations in works published in Spain: illustrations are scarce in Enciso (two), more numerous in Faleiro (around seventeenth), and increase significantly in Medina (around eighty).

Visually, the *Arte de navegar* stands out among these works, as seen from its frontispiece. Both nautical guides feature armillary spheres on their covers, and the *Suma de geographia* by Enciso also has a frontispiece depicting a large armillary sphere held by an arm within an ornate frame, with the title below in both editions. Similarly, Faleiro's *Tratado* has a large

44 "Sobre esto yo he procurado buscar alguna auctoridad o razón o alguna cosa en que esto tenga fundamento y digo que d'esta variación que del agua se dize no hallo cosa escripta, ni razón, ni experiencia que cierta sea." Medina, *Arte de navegar*, f. 82r.



Figure 2.4. Frontispiece of Pedro de Medina, *Arte de navegar*, Valladolid, 1545

armillary sphere with a simple frame as its frontispiece. Medina, however, breaks with this tradition, displaying instead the coat of arms of Emperor Charles V, reflecting the imperial patronage his work received.

Beyond its visual aspects, the *Arte de navegar* is notable for the large number of editions and translations it garnered across the Iberian Peninsula

and throughout Europe, establishing it as a model for sixteenth-century navigation manuals. Within a century of its publication, it was republished in fifteen French editions, five in Dutch, three in Italian, and two in English.⁴⁵

Despite its undeniable importance and influence on subsequent works of this kind, Medina's contribution builds upon established foundations, such as the nautical guides and Faleiro's *Tratado*, fitting within the nascent literary genre of nautical treatises dedicated to oceanic navigation. As David Waters notes:

Sixteen years later a great Portuguese scholar, Francisco Faleiro, writing in Castilian, published at Seville (in 1535) *Tratado del Esphera*. It was a notable work for many reasons, but particularly because it set the framework for subsequent manuals of navigation. [...] With its brilliant diagrams, clear tables and lucid text Medina's *Arte* was a masterpiece of exposition as it was of printing; nevertheless, its pattern was set by Faleiro.⁴⁶

Nonetheless, Pedro de Medina's *Arte de navegar* marks a clear turning point in this genre due to its widespread dissemination, which brought nautical subjects previously confined to the Iberian Peninsula into the literature of several other European countries.

A work that rivals Medina's in terms of impact is the *Breve compendio de la sphera y de la arte de navegar, con nuevos instrumentos y reglas, ejemplarizado con muy sutiles demostraciones* ("Brief Compendium of the Sphere and the Art of Navigation, with New Instruments and Rules, Exemplified with Very Subtle Demonstrations," 1551), by Martín Cortés, Spanish cosmographer. Though published in Seville, it was composed in Cádiz.⁴⁷ This work contains approximately 200 pages, where the investment in typography is evident through the inclusion of diagrams, decorative capitals, and marginal notes.

At the beginning of the book, there is a letter dedicating the work to Charles V. In this letter, Cortés praises the emperor, comparing him to the

45 Francisco José González, *Astronomía y navegación en España. Siglos XVI–XVIII* (Madrid: MAPFRE, 1992), 72.

46 David Waters, *The Iberian Bases of the English Art of Navigation in the Sixteenth Century* (Coimbra: [Separata da Revista da Universidade de Coimbra 24], 1970), 14.

47 This is an important information to understand some differences in the works of Medina and Cortés, because the authors were inserted in different traditions: Medina in the Casa de la Contratación, in Seville, and Cortés in Cadiz. José Ramón Carriazo Ruiz, *Tratados náuticos del Renacimiento: Literatura y lengua*, Estudios de Historia de la Ciencia y de la Técnica 24 (Valladolid [Salamanca]: Junta de Castilla y León, Consejería de Educación y Cultura; Universidad de Salamanca, 2003), 39.

gods of the Latin and Egyptian traditions. He also asserts that he is the first to condense all aspects of navigation into a brief compendium, intended to promote the highest achievements in navigation during the reign of Charles V, and to be “useful and profitable for those on land and indispensable for those at sea.”⁴⁸

Cortés offers the second dedication of his work to Don Álvaro de Bazán, the captain general of His Majesty’s fleet. He lists the many benefits of navigation and emphasizes one of its main dangers: the ignorance of pilots, who neither know nor wish to know more. Cortés assures readers that this compendium will greatly benefit all, providing the means to achieve the vital goal of “arriving safely and securely at port.” He claims to have made a greater effort than others to bring forth knowledge that many have kept concealed. In concluding the prologue, Cortés reveals that his motivation for writing this work was “the common benefit it could bring to those who wish to learn from home and to sailors, who are rarely able to be at home.”⁴⁹

In the frontispiece, beneath the title, we see the coat of arms of Charles V, flanked by two columns. Below, Latin inscriptions exalt the emperor. On the following page, there is an engraving of a man pointing toward the sky, likely representing an astronomer, astrologer, or mathematician. He gestures toward a star positioned in front of the sun, surrounded by clouds. On the ground are various objects, including a compass, a quill, a book, and an armillary sphere.

The *Breve compendio* is organized into three sections. The first section covers cosmography, a topic present since the nautical guides, and introduces basic navigational concepts such as the sphere, lines, angles, and the zenith. In the second section, Cortés describes the movements of the sun and moon, various instruments, divisions of time and tides, and storm patterns. The third section provides information on winds, nautical charts, the compass and magnetic declination, as well as guidance on the regiments of the sun, the north, and leagues. This section also covers instruments like the astrolabe and cross-staff, along with other tools for timekeeping. Throughout the text, illustrations and engravings are included to aid the reader’s comprehension.

The full title of this work reveals several intriguing aspects. At first glance, the reader recognizes a structure similar to that of the nautical guides,

48 “[...] com este breve compendio de navegación, a los de la tierra útil e provechoso, y a los de la mar tan necessario.” Martín Cortés, *Breve compendio de la sphaera y de la arte de nauegar* (Sevilha: Anton Alvarez, 1551), Carta al Cesar.

49 “[...] el provecho común que podía resultar a personas que desean en su casa saber y a marineros que jamás saben en ella parar.” Cortés, *Breve compendio de la sphaera*, Prologo.

Faleiro's *Tratado*, and Medina's *Arte de navegar*, indicated by the inclusion of the terms "sphere" and "the art of navigation." However, Cortés's ambition goes further: he aims to introduce new instruments and rules, accompanied by subtle demonstrations.

Indeed, Cortés's treatment of nautical instruments distinguishes his work from its predecessors. While some instruments are mentioned in the nautical guides, there is no explanation of their construction or use. In Faleiro's *Tratado*, instructions for the manufacture and employment of instruments appear, but are limited to the new shadow instruments he proposes. In contrast, Cortés places significant emphasis on instruments, as noted in the title. Nearly the entire third section of the book is devoted to a detailed description of these instruments, with guidance on their fabrication and application. This is no longer a brief collection of rules, like the nautical guides, where cosmography is summarized and only the essentials of navigational tables and regiments are condensed. Cortés's work is far more developed, with a richer and more complex narrative.

Reading the works of Medina and Cortés reveals that their intended audience likely differs from that of earlier texts. The nautical guides and Faleiro's *Tratado* were clearly designed to assist minimally literate pilots with practical navigation: they are small, straightforward books that focus solely on essential navigation topics, including examples, illustrations, vernacular language, and other accessible features. By contrast, Medina's and Cortés's works are more substantial in size, with a complex and advanced narrative targeting the empire's elite.

In the *Breve compendio*, as with Medina's work, imperial sponsorship is apparent through the dedication and the inclusion of Charles V's coat of arms. The frequent use of Latin phrases (as seen on the frontispiece), along with references to classical and biblical authorities and numerous marginal notes, indicates a scholarly dimension absent in earlier works. Unlike in the nautical guides, which contain no such references, and Faleiro's *Tratado*, which gives only a few minor citations, the references in Medina's work are more prominent—and in Cortés's text, they reach a level of prominence that surpasses all others. Additionally, the objects depicted in the engraving at the beginning of *Breve compendio* suggest that this work is more theoretical than practical.

In the prologue and dedication, Cortés explicitly identifies his intended audience as both theorists who remain on land and practitioners who sail. However, the characteristics of the work (its length, format, and scholarly language) seem better suited to those on land or for instructional use in the teaching of pilots. It is unlikely that the book would have been practical



Figure 2.5. Frontispiece of Martín Cortés, *Breve compendio de la esfera*, Sevilla, 1551

for consultation during navigation, or well-received by sailors and pilots, who typically had limited education and were unfamiliar with Latin and the frequent allusion to classical authorities.

Cortés's *Breve compendio* became one of the most widely disseminated Iberian works of its time. While Medina's work gained particular popularity

in France, with around twenty editions, Cortés's work found favor in England, with at least six editions published throughout the sixteenth century.⁵⁰

As other nations began to navigate the ocean, similar nautical texts appeared outside the Iberian Peninsula. One of particular significance was *Spieghel der Zeevaerdt* by Lucas Waghenaeer, published in 1584.⁵¹ Shortly thereafter, in 1588, it was translated into English by Antony Ashley under the title *The Mariners Mirrour*.⁵²

The frontispiece of the work, a colorful illustration, is remarkable, and its elements are quite revealing. At the top, six men are depicted leaning over a globe. Framing this globe are two smaller spheres: the one on the right represents the earth, while the one on the left symbolizes the sky. On both sides, a series of interconnected instruments is illustrated, including a quadrant, an astrolabe, a cross-staff, and a sounding lead. Below, two men, one on each side, hold sounding leads. The bottom of the page centers a ship, flanked by two compasses. The title of the work is prominently displayed in the center, bordered by two columns.

Spieghel der Zeevaerdt, a work of approximately one hundred pages, is divided into two parts, with the second part published a year after the first. The author begins the book by providing instructions for those learning the art of navigation. He advises them to mark and sketch all visible landmarks (such as buildings, castles, churches, towers, and other significant features) while on board, and to record the distances using a compass. He also suggests they take note of the depth of sandbanks. Furthermore, he recommends that they compare the information on their charts with the actual locations they observe. To achieve this, the author encourages apprentices to seek guidance from the ship's master and other experienced sailors, and to make

50 María M. Portuondo, *Secret Science: Spanish Cosmography and the New World* (Chicago: University of Chicago Press, 2009), 52–53. It is important to note that one of the English translations of Cortés's work was completed by the famous English translator Richard Eden, in 1561.

51 An online scan of this work can be found at <https://dspace.library.uu.nl/handle/1874/210220>.

52 Full title of English translation: *The Mariners Mirrour Wherin may playnly be seen the courses, heights, distances, depths, soundings, flouds and ebs, risings of lands, rocks, sands and shoalds, with the marks for th'entrings of the Harbouroughs, Havens and Ports of the greatest part of Europe: their several traficks and commodities: Together with the Rules and instruments of Navigation*. The translation is fairly faithful to the original, apart from a few instances where Ashley changes the place names from Dutch to English and corrects the positions of some towns. He also makes some changes to the chart of the Thames estuary. The textual differences between the English version and the Dutch original are not relevant. G. R. Crone, "'The Mariners Mirrour' 1588," *The Geographical Journal* 119, no. 4 (1953): 457.

Figure 2.6. Frontispiece of Lucas Waghenae, *Spiegel der Zeevaert*, Leyden, 1584

use of the cross-staff and astrolabe, which, along with the compass, are essential instruments for safe and effective navigation.⁵³

After these recommendations, there is a set of tables related to the calendar and the moon, followed by quadrennial tables of solar declination. Compared to those found in the nautical guides, these tables are more compact, presenting only the date of the month along with the declination values in degrees and minutes. They occupy just two pages, whereas the corresponding tables in the Munich Guide, for instance, take up twelve pages.

The following section provides instructions for determining the phases and age of the moon, explaining how fixed stars are utilized in navigation. It includes a catalog of the main fixed stars (from 1588), which displays their longitude, declination, and right ascension values. Additionally, a table with the right ascension values of the sun is provided, along with instructions for calculating the height of the pole using stars located within the tropics that decline from the equator.

The text then continues with a section on instruments, beginning with a description and illustration of a movable star compass. This is followed by instructions for constructing and using a cross-staff, accompanied by an engraving. Finally, the text explains how to draw and use a true and accurate sea chart.

Next, the author provides bearings for all the coasts of Holland, Zealand, France, and Spain, along with a list of important latitudes for western and eastern navigation. This section also includes a regiment of leagues, as well as descriptions of currents, tides, and seabeds in various parts of Europe.

Continuing in the first part of the work, a section titled "A Description and Portrait of the Greatest Part of the Seacoasts of Europe" begins with a map of western Europe, followed by twenty-two charts of "Western Navigation," which cover the coasts from Texel to Cádiz. The second part of the work contains twenty-three charts of "Eastern Navigation," detailing the waters east of the Zuiderzee, extending to Norway and Finland.⁵⁴

Waghenaer's work was highly successful in Holland and throughout Europe, resulting in multiple editions and translations. Its impact was so significant that it even gave rise to a new literary genre known as "Waggoners" in England.

53 Anthony Ashley, *The Mariners Mirrour* (London, 1588), "An Author's Admonition to the Reader."

54 Günter Schilder, "A Dutch Manuscript Rutter: A Unique Portrait of the European Coasts in the Late Sixteenth Century," *Imago Mundi* 43 (1991), 61.

Despite its importance, the *Spiegelhel* differs from other works, such as the nautical guides and Faleiro's *Tratado*, not only in terms of the chronological distance of their publication but also in content. Early Iberian treatises primarily focused on oceanic navigation and methods for determining a ship's position at sea, while the *Spiegelhel* mainly addresses coastal navigation, complete with descriptions and illustrations of Europe's coasts. The work's emphasis on coastal profiles, seabed topography, and soundings highlights a continued focus on coastal navigation, setting it apart from other Iberian manuals less concerned with such matters. It is worth noting that the Dutch only began to systematically explore oceanic navigation in the early seventeenth century, underscoring both the transformation of the genre, and the geographical conditions that shaped it.

An interesting aspect that sets the *Spiegelhel* apart is its lack of the cosmographic element of the sphere found in earlier works. A possible reason for this absence is that, as educational systems and institutions evolved, it became unnecessary for pilots. By that time, pilots and sailors would have already acquired this knowledge, rendering its inclusion in manuals redundant. However, later works such as Céspedes's *Regimiento de navegación* and John Davis's *The Seaman's Secrets* reincorporate the cosmographic section, suggesting that *Spiegelhel*'s primary focus is on coastal navigation, despite having some information on oceanic navigation. Moreover, the numerous maps included in the work represent a unique and novel feature, absent in the previously mentioned treatises, and further pointing to coastal navigation as the central concern of the *Spiegelhel*.⁵⁵

Another milestone of the emergence of nautical treatises in Europe is John Davis's *The Seaman's Secrets*, published in England in 1594 by Thomas Dawson.⁵⁶ This hundred-page book is dedicated to Lord Charles Howard, captain general of the Royal Navy. Unlike the authors of the works discussed so far, who were primarily cosmographers, Davis was a sailor himself. He writes with the authority of someone who has experienced the challenges of the sea, emphasizing this in his dedication: "[...] to present unto your most honourable favour this small treatise of Navigation, being a breefe

55 Pedro de Medina's *Arte de navegar* contains only one nautical chart, as does Cortés, who reproduces the same nautical chart as Medina.

56 Full title: *The Seaman's Secrets. Divided into 2 parts, wherein is taught the three kinds of sailing, horizontal, paradoxal and sailing upon a great circle: also an horizontal tide table for the easy finding of the ebbing and flowing of the tides, with a regiment newly calculated for the finding of the declination of the Sun and many other most necessary rules and instruments, not therefore set forth by any.* Thomas Dawson was a well-known printer in London, highly productive between 1568 and 1620, publishing mostly religious works and scientific treatises.

collection of such practises as in my severall voyages I have from experience collected.”⁵⁷ The purpose of the book is also clearly stated in the dedication:

To manifest the necessary conclusions of Navigation in breefe and shorte termes is my only intent, and therefore I omit to declare the causes of tearmes and diffinition of artificiall wordes, as matter superfluous to my purpose, neither have I laid downe the cunning conclusions apt for Schollars to practise upon the shore, but onely those things that are needfully required in a sufficient Seaman.⁵⁸

Davis presents his work as a practical guide to navigation, containing only the essential information needed for this purpose. Consequently, his text shares more similarities with earlier Iberian treatises, such as the nautical guides and Faleiro's *Tratado*, than with the more theoretical works of Medina and Cortés. The structure of the text adheres to the typical format of navigational treatises, divided into two parts: one focusing on the practical aspects of navigation and the other addressing cosmography.⁵⁹ Each section's title takes the form of a question, subsequently answered by the author.⁶⁰

The first part of the work addresses a range of topics, including an introduction to navigation, navigation courses, necessary instruments, the movement and age of the moon and its impact on tides, and the regiments of leagues, the pole, and the sun, as well as the sun's declination. Davis then explains basic concepts such as the zenith and provides an overview of nautical charts and their uses. Finally, he offers a brief summary of the topics covered.

The second part of *The Seaman's Secrets* is entitled “Wherein is Taught the Nature and Most Necessary Use of the Globe, with the Circles, Zones,

57 John Davis, *The Voyages and Works of John Davis the Navigator*, ed. Albert Hastings Markham, Works Issued by the Hakluyt Society, Ser. 1, 59 (London: Hakluyt Society, 1880; repr., Farnham: Ashgate, 2010), 231.

58 Davis, *The Voyages and Works of John Davis the Navigator*, 238.

59 Davis highlights the importance of cosmography to navigation at the end of the first book: “to the purpose of navigation, we must understand Cosmography to be the universall description of the terrestriall Globe, distinguished by all such circles, by which the distinction of the celestiall Sphere is understoode to be given, with every Country, Coast, Sea, Harborow, or other place, seated in their one longitude, latitude, Zone and Clyme.” Davis, *The Voyages and Works of John Davis*, 285.

60 The first question that appears in the book is, “What is Navigation?” and the answer, “Navigation is that excellent art which demonstrated by infallible conclusion how a sufficient ship may be conducted the shortest good way from place to place by corse and traverses.” Davis, *The Voyages and Works of John Davis the Navigator*, 239.

Climates, and Other Distinctions for the Perfect Use of Sailing.” This section explains concepts related to cosmography and the sphere, including the equator, equinoctial, ecliptic, zodiac, colures, tropics, poles, meridian, and horizon. It also presents the division of the world into zones and climates, discusses paradoxical navigation, describes methods for determining the height of the poles, and outlines ways to locate the sun on the ecliptic, as well as how to tell time at night using fixed stars.⁶¹

The text concludes with an exploration of three instruments. First, Davis discusses the cross-staff, beginning with an explanation of the conventional cross-staff before introducing a variation of his own design, in which the user stands with the sun at their back and observes its shadow. He provides a detailed explication of the construction and use of this instrument, emphasizing the excellence of his discovery.⁶² He then briefly mentions the quadrant and astrolabe, accompanied by illustrations.

Davis’s work closely follows the structure of Iberian navigation treatises, with a slight variation in the sequence of subjects—it places the section on the art of navigation before cosmography. Another notable difference is the absence of tables for solar declination, which had been a consistent feature since the nautical guides. This omission is intriguing, as the author presents the book as practical yet excludes these tables.

As we have seen, the genre of nautical treatises inaugurated by the nautical guides of Munich and Évora extended well beyond the Iberian Peninsula. As other countries developed their navigation methods and began sailing far from the coast, they also needed to codify information on oceanic navigation; however, they had the advantage of established models to build upon. The widespread dissemination of Pedro de Medina’s *Arte de navegar* and Martín Cortés’s *Breve compendio* among Europe’s major maritime powers led to the creation of works with similar structures and content in these countries, such as *Spiegelhel* and *The Seaman’s Secrets*, among others.

61 Regarding the division of the world into five zones, it is noteworthy that the author disputes the ancient notion by using his personal experiences: “[...] but in these our dayes we find by experience that the auncient Geographers had not the due consideration of the nature of these zones, for three times I have been within the Artick frozen zone, where I found the ayre very temperate.” Davis, *The Voyages and Works of John Davis*, 306. This refutation, supported by recent discoveries, is also present in cosmographers’ works, but is rarely presented in a first-person perspective.

62 “[...] and therefore no instrument may compare with the excellencie of this crosse staffe for the Seamans use.” Davis, *The Voyages and Works of John Davis*, 337. This instrument became known as backstaff or Davis quadrant.

Analyzing these works enables us to establish connections between them, revealing their mutual influences and their impact on the development of this literary genre. By examining both the similarities and distinctions within these treatises, it is possible to better understand the technical challenges navigation faced during this period of great change and how these nautical texts sought to address them.

Conclusion

The sixteenth century in the Iberian Peninsula was marked by significant technical and scientific advances in oceanic navigation, accompanied by developments in nautical literature. The nautical guides represent the first effort to codify and compile the essential knowledge required for navigation into a printed text. Their style and content suggest that they were intended for practical individuals without scholarly backgrounds, such as sailors and pilots, who needed to adapt to the new demands of oceanic navigation, and to acquire a basic understanding of cosmography.

These small works, written in a simple language, aim to establish the body of knowledge necessary for the practice of astronomical navigation. As a result, for the first time in a nautical work, two key components are brought together: cosmographic content (the Sphere, in its first vernacular version) and navigational instructions (the regiments). This core structure would be replicated in subsequent works of this type, with a gradual effort to enhance and expand the information included in such texts over time.

This is evident in various titles where authors aim to provide the reader with “newly written rules” (Francisco Faleiro), “rules, declarations, secrets, and notices” (Pedro de Medina), or “new instruments and rules” (Martín Cortés). The expansion and refinement of these texts is likely linked to the emergence of oceanic pilots as a new professional group, needing the theoretical tools required for astronomical navigation. Faleiro’s work closely follows the structure of the guides, developing and supplementing it while maintaining its goal of being straightforward and easily accessible for a less educated audience. The royal privilege granted to the work and its dedication further illustrates the growing interest of the empire and its court in this type of publication.

Through Faleiro’s work, a standard of content was established that would later spread beyond the Iberian Peninsula. The works of Medina and Cortés, being larger and more complex, deviate slightly from the practical focus of earlier treatises. Nonetheless, these works achieved significant dissemination

outside the Iberian Peninsula and influenced the creation of other texts in the same genre, such as the *Spiegel* and *The Seaman's Secrets*. Although they generally follow a similar structure, their content varies. For example, the *Spiegel* omits the cosmographic section and includes nautical charts, auguring a distinct shift in this literary tradition. Subsequently, another genre would materialize within this tradition: nautical rutters, which can already be seen in Céspedes's *Regimiento de navegación*.

It is noteworthy that the authorship of these works, initially undefined (as seen in the nautical guides) becomes increasingly salient over time. The authors, primarily cosmographers, assert their authority and establish their distinct voices, as evidenced by the paratexts of their works, such as dedications. This movement toward cosmographer empowerment arises from a context in which two distinct groups—pilots and cosmographers—were attempting to reconcile their differing approaches to navigation.⁶³

The treatises frequently highlight the ignorance of pilots and emphasize the need to educate them in astronomical navigation, which the authors claim is the primary purpose of their works. Meanwhile, pilots resist the theoretical and mathematical demands imposed by cosmographers, favoring simpler, traditional methods that, while not mathematically precise, proved effective in practice.⁶⁴ This new literary genre, established during the sixteenth century, reflects the tension between the disciplined approach to navigation advocated by cosmographers and the practical needs of pilots.

Nautical treatises did not exist prior to the early sixteenth century; they were born out of necessity and consolidated over time. Rather than constituting a rigid genre, such works constantly adapted to the influence of various external factors, such as the state of navigation technology at the time of writing, the cultural and political context of each country, and the prevailing systems for pilot education. A correlation can be observed between the power of contemporary empires and the development of this literary genre, as nearly all these works were published with royal privilege or support from court-related figures and were printed by the most reputable printing houses.

63 This discussion between pilots and cosmographers is well studied and documented in Alison Sandman, "Cosmographers vs. Pilots: Navigation, Cosmography, and the State in Early Modern Spain" (PhD diss., University of Wisconsin, 2001).

64 It was also in this context that Céspedes wrote his work, albeit adopting a different position than most cosmographers of his time. Being an important cosmographer of the Casa de la Contratación, he supported the pilots' point of view regarding several matters. See Alison Sandman, "An Apology for the Pilots' Charts: Politics, Projections and Pilots' Reports in Early Modern Spain," *Imago Mundi* 56, no. 1 (2004): 7–22.

This chapter has aimed to contribute to the understanding of the emergence of this new genre of technical literature dedicated to oceanic navigation, examining the aforementioned works collectively and contextualizing them within this developmental trajectory.

Acknowledgements

I would like to thank the entire Rutter Project team for their support in the research I carried out for this chapter, for their contributions and insightful discussions, which greatly enriched this work, and especially Professor Henrique Leitão for his careful guidance.

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3. Monitoring the Paths of the Sea: Rutters, Laws, and Long-Distance Control in Sixteenth-Century Iberian Empires

José María Moreno Madrid

Abstract: Among the many processes triggered by early modern Iberian maritime expansion was the juridical appropriation of the oceans. Discussions regarding the regulation of oceanic spaces occurred at both international and internal levels, with the aim of developing efficient procedures to monitor the performance of the Portuguese and Spanish fleets on their voyages. This chapter examines several innovative juridical mechanisms created by the administrative apparatuses of the Iberian empires during the sixteenth and seventeenth centuries to establish and oversee the precise ‘route’ to be followed by their ships. In theory, these regulations sought to control long-distance voyages; however, in practice, the regulation of areas so distant from the centers of decision-making proved to be a challenging task.

Keywords: routes, history of law, rutters of instruction, Spain, Portugal, long-distance control.

Introduction

Oceanic navigation and its consequent overseas expansion brought about profound changes in the early modern European world. From lands that had been considered nonexistent only a few decades earlier, a flood of objects and information now arrived, fascinating but also overwhelming the minds and institutions of the Old Continent. A “change of scale” in global

perception and interaction was taking place.¹ The process of adapting to this new reality took place at different speeds in the European states, due to the different chronologies of their involvement in transoceanic projects. Portugal and Spain, which were the first to go further out into the Atlantic, were also the first to be forced to deal with problems and situations that had never been faced before and for which innovative solutions were needed.² Deepening knowledge of the natural world and the systematic accumulation of information about it were common processes used to address many of these issues and build the foundations of empire.³ Therefore, this endeavor was key to overcoming one of the major obstacles to establishing, consolidating, and maintaining an overseas empire: *systematizing* and *controlling* long oceanic routes.⁴ As might be expected, the imperial legal apparatus was a fundamental tool in the attempt to regulate long-distance navigation.

1 Henrique Leitão, "Um mundo novo e uma nova ciência," in *360º Ciência Descoberta*, ed. Henrique Leitão (Lisboa: Fundação Calouste Gulbenkian, 2013), 15–41.

2 In this context were created specific institutions for technical education and for the accumulation and management of information—e.g., the Casa da Índia in Portugal and the Casa de la Contratación in Spain—; new professionals, intermediate between scholars and artisans, emerged; and new cognitive devices—such as cartographic models or oceanic rutters—were developed. See Henrique Leitão and Antonio Sánchez, "Zisel's Thesis, Maritime Culture, and Iberian Science in Early Modern Europe," *Journal of the History of Ideas* 78, no. 2 (2017): 191–210.

3 As Antonio Sánchez states: "Atlantic empiricism was not based on the causal analysis of the secrets of nature, but on procedures of observation, experimentation, and representation of the phenomena in response to the utilitarian demands of the imperial policies," in Antonio Sánchez, "Practical Knowledge and Empire in the Early Modern Iberian World: Towards an Artisanal Turn," *Centauros* 61, no. 3 (August 2019): 4. On this topic, see also Antonio Sánchez, "The 'Empirical Turn' in the Historiography of the Iberian and Atlantic Science in the Early Modern World: From Cosmography and Navigation to Ethnography, Natural History, and Medicine," *Tapuya: Latin American Science, Technology and Society* 2, no. 1 (January 1, 2019): 317–334; Antonio Barrera-Osorio, *Experiencing Nature: The Spanish American Empire and the Early Scientific Revolution* (Austin: University of Texas Press, 2006); Antonio Barrera-Osorio, "Empire and Knowledge: Reporting on the New World," *Colonial Latin American Review* 15, no. 1 (2006): 39–54; Jorge Cañizares-Esguerra, *Nature, Empire, and Nation: Exploration of the History of Science in the Iberian World* (Stanford: Stanford University Press, 2006); Juan Pimentel, "The Iberian Vision: Science and Empire in the Framework of a Universal Monarchy, 1500–1800," *Osiris, Nature and Empire: Science and the Colonial Enterprise*, 15 (2000): 17–30; Arndt Brendecke, *Imperio e información. Funciones del saber en el dominio colonial español* (Madrid: Iberoamericana; Frankfurt: Vervuert, 2012).

4 As John Law already noted for the Portuguese India Run in John Law, "On the Methods of Long-Distance Control: Vessels, Navigation and the Portuguese Route to India," *The Sociological Review* 32, no. 1 (1984): 234–263. It also can be found in John Law, "On the Methods of Long-Distance Control: Vessels, Navigation, and the Portuguese Route to India," in *Power, Action and Belief: A New Sociology of Knowledge? Sociological Review Monograph*, ed. John Law (Routledge: Henley, 1986), 234–263.

Legal practices related to the sea were not unaffected by the “change of scale.” It is true that Roman maritime law remained the basic legal reference,⁵ and that certain medieval codes could still be observed,⁶ however, all of them had been designed to be applied in the *small* European seas, so the scope of their answers was limited.⁷ As early as the fifteenth century, the eagerness of Portugal and Spain to share the newly discovered lands led to bilateral treaties, usually ratified by papal authority.⁸ A landmark

5 Since ancient times, the coasts were considered “common use” (*res commune*), the sea itself being understood as a space for communication and trade. This status could change in times of war, when the coasts became a gateway for invasion and had to be defended. Thus, as conflicts between peoples increased, maritime coasts became targets for fortification and a certain informal concept of belonging began to permeate them. A paradigmatic example of this process is the Mediterranean at the time of the Roman Empire. The *Mare Nostrum* was almost entirely dominated by Rome, and consequently Celsus (67–130) claimed that its shores were also the property of the Roman people. Celsus's words, however, were not supported by the Code of Justinian, one of the great Roman legal monuments: it stated that the air, the flowing waters, and the sea—and therefore the coastline—were *res communes* and therefore could not be appropriated. Such a condition did not extend to islands and territories *abandoned* at sea, which could be subject to occupation because they were considered *res nullius*. Fernando Marín Castán, “Marco jurídico de la seguridad marítima,” *Cuadernos de Estrategia* 140 (2008): 171–172.

6 Concern for the legal regulation of the sea resurfaced vigorously in the late Middle Ages, in contrast to the modest production of legal texts in the early Middle Ages. Behind this revival could be the ambitions of several states that, from the twelfth century onwards, sought a privileged position in the European seas. This is the case of Sweden and Denmark in the Baltic and Norwegian Seas, Venice in the Adriatic, Pisa in the Ligurian Sea, and Britain in the so-called British Seas (Benjamin Parameswaran, *The Liberalization of Maritime Transport Services* [Berlin: Springer, 2004], 77). Therefore, during that period a number of highly relevant legal texts appeared, among which stand out the *Rolls of Oleron*, the *Libro del Consulado del Mar*, the *Laws of Wisby*, and the *Tabula Amalfitana*. No less important were the *Partidas* of Alfonso X of Castile, which drew on Justinian law in maritime matters, keeping the sea and its shore as *res commune* (Marín Castán, “Marco jurídico de la seguridad marítima,” 172).

7 All these texts, despite their undoubted relevance for the history of law, are still local compilations that do not integrate and/or constitute a common law of the sea for the maritime areas they regulate. Edda Frankot demonstrates this for the North Sea in Edda Frankot, “Medieval Maritime Law from Oléron to Wisby: Jurisdictions in the Law of the Sea,” in *Communities in European History. Representations, Jurisdictions, Conflicts*, ed. Juan Pan-Montojo and Frederik Pedersen (Pisa: Edizioni Plus-Pisa University Press, 2007); Edda Frankot, “*Of Laws of Ships and Shipmen*: Medieval Maritime Law and Its Practice in Urban Northern Europe (Edinburgh: Edinburgh University Press, 2012).

8 In 1436 Eugene IV promulgated the bull *Dudum cum ad nos* to resolve the conflict over the possession of the Canary Islands; in 1452 Nicolas V promulgated the bull *Dum diversas*, which granted Afonso V of Portugal the right to enslave Saracens and pagans in West Africa; in 1455 the same pope promulgated the bull *Romanus Pontifex*, which reinforced the provisions of the previous bull and granted Portugal the ownership of the territories located south of Capes Bojador and Nam; in 1456 Calixtus III promulgated the bull *Inter caetera*, which reaffirmed the validity

event in this process was the signing of the Treaty of Tordesillas in 1494, which divided the known world between Spain and Portugal through a line that would be placed 370 leagues west of the archipelago of Cape Verde.⁹ The rich history of the conceptualization and practical understanding of this line is beyond the scope of this chapter.¹⁰ Suffice it to say that it played a fundamental role as a diplomatic instrument, preserving peace on the Iberian Peninsula for more than a century. Some authors have considered this treaty as a reasonable starting point for the development of the current law of the sea.¹¹

of the *Romanus Pontifex*; in 1481 Sixtus IV promulgated the bull *Aeterni Regis*, which sanctioned what had been agreed upon in the Treaty of Alcaçovas; in 1493 Alexander VI promulgated the bulls *Inter caetera*, *Eximiae devotionis*, a second one called *Inter caetera*, and *Dudum siquidem*, all very favorable to the interests of the Catholic Monarchs with regard to the ownership of the new American lands.

9 There is a vast body of literature on the Treaty of Tordesillas. Among others, see: Luis de Albuquerque, "O Tratado de Tordesilhas e as dificuldades técnicas da sua aplicação rigorosa," in *El Tratado de Tordesillas y su proyección* (I Colóquio Luso-Espanhol de História do Ultramar, Valladolid: Universidad de Valladolid, 1973), I:221–257; Ana María Carabias Torres, "Los conocimientos de cosmografía en Castilla en la época del Tratado de Tordesillas," in *El Tratado de Tordesillas y su época*, ed. Luis Antonio Ribot García, Adolfo Carrasco Martínez, and Luís Adão da Fonseca (Madrid: Junta de Castilla y León, 1995), 959–976; F. Paulino Castañeda, "El Tratado de Alcaçovas y su interpretación hasta la negociación del Tratado de Tordesillas," in *El Tratado de Tordesillas y su proyección* (Valladolid: Universidad de Valladolid, 1973), I:103–115; Ricardo Cerezo Martínez, "El meridiano y el antimeridiano de Tordesillas en la Geografía, la Náutica y la Cartografía," *Revista de Indias* 54, no. 202 (1994): 509–542; Lourdes Díaz-Trechuelo, *El Tratado de Tordesillas y su proyección en el Pacífico* (Madrid: Asociación Española de Estudios del Pacífico, 1994); Thomas Duve, "El Tratado de Tordesillas: ¿Una "revolución espacial"? Cosmografía, prácticas jurídicas y la historia del derecho internacional público," *Revista de Historia del Derecho* 54 (December 2017): 77–107; Ursula Lamb, "Dos huellas científicas del Tratado de Tordesillas," in *Cosmographers and Pilots of the Spanish Maritime Empire* (Aldershot: Variorum, 1995), X:185–193; Eufemio Lorenzo, Francisco Gallego, and Gloria Tejedor, *El Tratado de Tordesillas* (Madrid: Junta de Castilla y León, V Centenario Tratado de Tordesillas, and Anaya Educación, 1995).

10 See: José María Moreno Madrid and Henrique Leitão, *A longitude do mundo. Viagens oceânicas, cosmografia matemática e a construção de uma Terra global* (Lisboa: Imprensa Nacional-Casa da Moeda, forthcoming).

11 Tullio Treves, "Historical Development of the Law of the Sea," in *The Oxford Handbook of the Law of the Sea*, ed. Donald R. Rothwell et al. (Oxford: Oxford University Press, 2015), 3; Scott G. Borgerson, *The National Interest and the Law of the Sea* (New York: Council Foreign Relations, 2009), 6. At present, "maritime law" should not be confused with "law of the sea" or "international maritime law." The first, "maritime law," refers to legal rules applied to maritime disputes between private parties, while "law of the sea" or "international maritime law" is an international body of law that regulates the rights and duties of states in the maritime field. For broader, non-Eurocentric perspectives on the origins and development of the law of the sea see R. P. Anand, *Origin and Development of the Law of the Sea: History of International Law Revisited* (The Hague: Martinus Nijhoff, 1983); Hassan Salih Khalilieh, *Islamic Maritime Law:*

As the sixteenth century progressed, both Iberian kingdoms expanded their areas of influence in the waters that were no longer considered *res communes* but *mare clausum* under the Treaty of Tordesillas. This means that, in practice, Portugal and Spain *really* considered vast swaths of territory—like the Atlantic or the Pacific—to be *private property*. For most of the century, this circumstance did not pose an international problem, since no other European power systematically practiced long-distance oceanic voyages; nevertheless, several Spanish authors questioned under what prerogatives it was possible to claim ownership of the seas.¹² By the 1570s, English nautical science had improved enough to pose some serious challenges to the Iberian *mare clausum*.¹³ For example, when Philip II's ambassadors in England demanded that Elizabeth I (1533–1603) answer for Francis Drake's raids in the Pacific, she invoked the Justinian Code stating that "the use of sea and air is common to all; neither can any title to the ocean belong to any people and private man, for as much as neither nature nor regard of the public use permitteth any possession thereof."¹⁴ The debate gained in intensity with the entry on the scene of the Dutch and their pretensions on the Portuguese *Carreira da Índia*,¹⁵ and reached a turning point in 1609 with the publication of Hugo Grotius's (1583–1645) *Mare*

An Introduction (Leiden: Brill, 1998); Hassan S. Khalilieh, *Islamic Law of the Sea: Freedom of Navigation and Passage Rights in Islamic Thought* (Cambridge: Cambridge University Press, 2019). For an approach to current legislation see, among others: Yoshifumi Tanaka, *The International Law of the Sea*, 2nd Edition (Cambridge: Cambridge University Press, 2015).

12 Nieves San Emeterio, "El debate sobre el dominio de los mares en el imperio español durante los siglos XVI y XVII," *Iberian Journal of the History of Economic Thought* 7, no. 2 (October 22, 2020): 133–142; Nicolás Salom-Franco, "Vitoria y Grocio frente al mar," *Estudios Socio-Jurídicos* 3, no. 1 (2001): 93–141.

13 See David W. Waters, *The Art of Navigation in England in Elizabethan and Early Stuart Times* (London: Hollis and Carter, 1958); David Waters, *The Iberian Bases of the English Art of Navigation in the Sixteenth Century* (Coimbra: [Separata da Revista da Universidade de Coimbra 24], 1970).

14 Quoted in: Siobhan Carroll, *An Empire of Air and Water: Uncolonizable Space in the British Imagination, 1750–1850* (Philadelphia: University of Pennsylvania Press, 2015), 221.

15 André Murteira, *A Carreira da Índia e o curso neerlandês, 1595–1625* (Lisboa: Tribuna da História, 2012); André Murteira, "Ingleses e neerlandeses contra a Carreira da Índia no Índico Ocidental, 1621–1623," *Oriente* 19 (Otono 2008): 3–26; André Murteira, "La Carreira da Índia y las incursiones neerlandesas en el Índico Occidental, 1604–1608," in *España y Portugal en el Mundo (1581–1668)*, ed. José Antonio Martínez Torres and Carlos Martínez Shaw (Madrid: Edições Polifemo, 2014), 299–314; André Murteira, "Combates luso-neerlandeses em Santa Helena (1597–1625)," *Anais de História de Além-Mar* 7 (2006): 65–80; Martine Julia van Ittersum, "Hugo Grotius in Context: Van Heemskerck's Capture of the *Santa Catarina* and Its Justification in *De Jure Praedae* (1604–1606)," *Asian Journal of Social Science* 31, no. 3 (January 1, 2003): 511–548.

Liberum.¹⁶ Considered by many to be the founding text of the present-day law of the sea, Grotius's work sparked the so-called "Battle of the Books": a sort of open debate in which several contemporary jurists and scholars—Nicolás Bonaert (1564–?), Serafim de Freitas (ca. 1553–1633), John Selden (1584–1654) and William Welwood (1552–1624)—gave written replies to the Grotian postulates on the freedom of the seas.¹⁷

Although this is a very interesting issue for the history of international maritime law, it is obvious that the sovereigns and administrators of the empires of the time did not pay much attention to it when organizing and regulating their transoceanic enterprises. Even less so in the sixteenth century, when the problem was just beginning to surface. In practice, control was sought through the legal apparatus of each empire, which differed significantly from the legal systems that govern us today. Regarding the legal instruments in Iberia,¹⁸ Arndt Brendecke explains that, at the time, it was difficult to distinguish between genuine *legal acts* and the rest of the royal correspondence with statements that constituted *law*—resulting in a wide range of legally valid documents.¹⁹ Thus, royal provisions, decrees, charters,

16 English translation of the text: Hugo de Groot, *The Freedom of the Seas, or the Right Which Belongs to the Dutch to Take Part in the East Indian Trade*, tr. Ralph van Deman Magoffin, ed. James Brown Scott (New York: Oxford University Press, 1916).

17 On the "Battle of the Books" see: W. S. M. Knight, "Grotius in England: His Opposition There to the Principles of the *Mare Liberum*," *Transactions of the Grotius Society* 5 (1919): 1–38; Eric G. M. Fletcher, "John Selden (Author of *Mare Clausum*) and His Contribution to International Law," *Transactions of the Grotius Society* 19 (1933): 1–12; R. Warden Lee, "Grotius—The Last Phase, 1635–45," *Transactions for the Year* 31 (1945): 193; Jonathan Ziskind, "International Law and Ancient Sources: Grotius and Selden," *The Review of Politics* 35, no. 4 (1973): 537–559; George Smith, "The Concept of Free Seas: Shaping Modern Maritime Policy within a Vector of Historical Influence," *International Lawyer* 11, no. 2 (January 1, 1977): 355–363; Peter Borschberg, "Hugo Grotius, East India Trade and the King of Johor," *Journal of Southeast Asian Studies* 30, no. 2 (1999): 225–248; Monica Brito Vieira, "Mare Liberum vs. Mare Clausum: Grotius, Freitas, and Selden's Debate on Dominion over the Seas," *Journal of the History of Ideas* 64, no. 3 (2003): 361–377; Martine Julia van Ittersum, "Mare Liberum versus the Propriety of the Seas? The Debate between Hugo Grotius (1583–1645) and William Welwood (1552–1624) and Its Impact on Anglo-Scotto-Dutch Fishery Disputes in the Second Decade of the Seventeenth Century," *The Edinburgh Law Review* 10 (2006): 239–276; Helen Thornton, "John Selden's Response to Hugo Grotius: The Argument for Closed Seas," *International Journal of Maritime History* XVIII, no. 2 (December 2006): 105–127; José Antonio Martínez Torres, "'Gobernar el Mundo'. La polémica *Mare Liberum versus Mare Clausum* en las Indias Orientales (1603–1625)," *Anuario de Estudios Americanos* 74, no. 1 (2017): 71.

18 Brendecke's analysis is based on the Spanish reality, but it can be broadly applied to the Portuguese context.

19 Brendecke, *Imperio e información*, 348. There is also an English translation: Arndt Brendecke, *The Empirical Empire: Spanish Colonial Rule and the Politics of Knowledge* (Berlin: De Gruyter Oldenbourg, 2016). This does not mean that no progress at all was made in the organization and systematization of legal texts. In the case of Spain, the legislative work of the Catholic Monarchs

warrants, ordinances, and *pragmáticas* could all contain legally binding decisions of the monarch, which were often made on a case-by-case basis. This practice is also known as “subjective law,” and its defining characteristic is that the legal norm was in principle granted to the individual or reported to the institution concerned; that is, it was not mandatory to record such norms in a generally valid and publicly accessible compilation of laws.²⁰

This is the context in which, from the end of the fifteenth century, a new regulable entity appeared within the framework of long-distance control: the oceanic route. For the architects of the *mare clausum*, the oceanic routes stretched across the oceans, just as the terrestrial routes stretched across their land-based imperial domains.²¹ As such, they could (and should) also be subject to legal control. What was the *exact* route to follow? Was it possible to deviate from the established route? If such a possibility existed, what were the circumstances under which it could be exercised? Who was responsible for establishing the procedure to be followed in the event

was of great importance. For example, in 1480 they approved the *ordenamiento* of the Courts of Toledo, one of the most comprehensive in terms of judicial organization, since it gave new organization to the royal council, adjusted the functioning of the *chancillerías* and the *audiencias* and regulated the function of the *corregidores*, among other things. Charles V (1500–1558), for his part, approved the *ordenamiento* of the Courts of Valladolid of 1518, the *ordenanzas* of the Courts of the same city of 1537, the *Colección de Ordenanzas* of 1543 for the *alcaldes mayores* or the *ordenanzas* for the *audiencias* and royal council of 1554. José Tomé Paule, “La organización judicial española durante la Edad Moderna,” *Revista de Derecho Procesal Iberoamericana Separata* (1982): 453–487. In the case of Portugal, the process of consolidation and organization of the state gained special relevance with King Manuel I (1469–1521). During his reign, the concept of the “state” as a legal person, endowed with rights and duties, became a reality. Consequently, previous legislative texts were revised, specifically the Afonsine code—issued during the reign of Afonso V (1432–1481). For this task, King Manuel commissioned a group of jurists to compile a new legislative code for the kingdom, which was published in 1514 under the name of *Ordenações Manuelinas*. This text was replaced in 1521 by a second updated version. The *Ordenações da Índia*, published in 1520, is another example of the effort to systematize and organize previous legal texts. Bruno Neves, “A legislação da Carreira da Índia: Caracterização e análise da sua evolução, 1500–1580” (MA thesis, Lisboa, Universidade de Lisboa, 2004), 35.

20 Brendecke, *Imperio e información*, 347–348.

21 The metaphor of sea routes as “pathways over water” was already common at the time and can be found in several nautical texts by important authors. Perhaps one of the most famous is this one by Martín Cortés de Albacar: “I say that sailing is nothing more than walking on water from one place to another. [...] This way differs from the way of the earth in three things: that of the earth is firm, this way is flexible; that of the earth remains, this way is movable, and that of the earth is marked and that of the sea is unknown. And if the ways of the earth are steep and rough, the sea pays for them with the serenities in storms. Being such a difficult path, it would be difficult to put it into words, or to write it down with a pen.” Martín Cortés de Albacar, *Breve compendio de la sphaera y de la arte de navegar con nuevos instrumentos y reglas, ejemplificado con muy sutiles demostraciones* (Sevilla: Antón Álvarez, 1551), f. 61v.

of a deviation? Were any penalties imposed for an unjustified deviation? Which ones? The following pages will attempt to identify instances where these questions were addressed by the judicial apparatus of the overseas empires of the sixteenth century. This will be done by examining specific documentary examples and more general compilations of laws.

3.1. Rutters of Instruction and the Route of the *Aviso* Ships

One of the challenges posed by the “change of scale” was the organization and distribution of official correspondence around the globe. In the case of the Spanish empire, the solution devised for the oceanic routes was the *Aviso* ships. These were small, fast, shallow-draft vessels that were reinforced from the end of the sixteenth century to counter the threat of pirates and corsairs. After the reorganization of the fleets in 1561, the *Aviso* ships sailed in convoy to America, accompanied by merchant ships and warships; then they returned alone to the Iberian Peninsula. The Casa de la Contratación was the institution responsible for the equipment and dispatch of these ships. The royal treasury allocated up to 10,000 ducats for their maintenance and 30,000 ducats for the payment of salaries, the dispatch of mail and the payment of taxes.²²

On these critical journeys, where it was so important to follow the fastest and safest route, a special document was always present on board: *rutters of instruction*. As Carmo Lacerda and I recently explained, “these rutters constitute an anomaly within the textual category itself since they were produced in a very particular context and with a very specific purpose.”²³

22 Jaime Ascandoni Rivero, “El correo durante el reinado de Felipe II,” in *Ciencia y técnica en la sociedad española de los siglos XVI y XVII*, ed. Enrique Martínez Ruiz, 1st ed. (Barcelona: Labor Universitaria, 1979), 267. For an in-depth analysis of the *Aviso* ships and the correspondence between America and Spain see: José María Vallejo García-Hevia, “Los navíos de aviso y los correos marítimos a Indias (1492–1898),” *Ivs Fvgit* 7 (1998): 197–266.

23 Carmo Lacerda and José María Moreno Madrid, “A Remarkable Collection of Rutters, 16th–18th Centuries: Derroteros que hacía el piloto mayor para que llevasen los jefes de las embarcaciones que iban a Indias,” *RUTTER Technical Notes Series* 6 (2021): 4. A significant part of these rutters used by the *Aviso* ship are preserved in a bundle in the Archivo General de Indias (Seville) [AGI] with reference number “Contratación, 4890.” The first historian to note their importance was José Pulido Rubio, who transcribed three of them in José Pulido Rubio, *El piloto mayor de la Casa de la Contratación de Sevilla: pilotos mayores, catedráticos de cosmografía y cosmógrafos de la Casa de Contratación de Sevilla* (Sevilla: CSIC / Escuela de Estudios Hispano-Americanos, 1950), 532–536. More recently, José María García Redondo has emphasized their importance in relation to the textual dimension of the *padrón real* in José María García Redondo, *Cartografía e imperio. El Padrón Real y la representación del Nuevo Mundo*

Some differences between these documents and what we conventionally call “rutters” or “sailing directions” should be emphasized.²⁴ Rutters of instruction were produced *on land*, rather than during the voyage itself as an immediate outcome of the observation of the natural world. They did not consist of a spontaneous recording, but were the result of filtering and adapting the information previously stored in the Iberian “centers of calculation.”²⁵ Since the Casa de la Contratación was responsible for the technical and scientific aspects of the *Aviso* voyages, and given their importance, it is not surprising that the pilot major (*piloto mayor*) was entrusted with the production of rutters of instruction.²⁶ It is worth noting that they constitute a very interesting example of how a cognitive device was constructed in the early modern Iberian “epistemic setting.”²⁷ The information on the route was collected by pilots and sailors, representatives of the artisanal communities linked to the nautical world. The rutter, however, was written by the pilot major, one of the “intermediate professionals” *par excellence*, who combined his theoretical training with the need to work with seamen. All of this took place under the auspices of a “specific institution” such as the Casa de la Contratación.²⁸ But beyond that, these documents have a

(Madrid: Doce Calles, 2018), 115–133 and José María García Redondo, “Derroteros, avisos y mapas. La dimensión textual del Padrón Real de la Casa de la Contratación,” in *Navegação no Atlântico. XVIII Reunião Internacional de História da Náutica*, ed. Francisco Contento Domingues and Susana Serpa Silva (Lisboa: CHAM-Centro de Humanidades, 2019), 147–161.

24 Some useful definitions of what is conventionally understood as a “rutter” can be found in: Charles R. Boxer, “Portuguese *Roteiros*, 1500–1700,” *The Mariner’s Mirror* 20, no. 2 (1934): 171–186; José Manuel Malhão Pereira, “*Roteiros* portugueses, séculos XVI a XVIII. Sua génese e influência no estudo da hidrografia, da meteorologia e do magnetismo terrestre” (PhD diss., Universidade de Lisboa, 2017); José Manuel Malhão Pereira, *Os roteiros e a expansão marítima portuguesa e europeia* (Lisboa: Academia das Ciências de Lisboa, 2017).

25 Lacerda and Moreno Madrid, “A Remarkable Collection of Rutters, 16th–18th Centuries,” 4. On the concept of “centers of calculation” see Bruno Latour, *Science in Action* (Cambridge, MA: Harvard University Press, 1987).

26 For example, many of them are signed by the Pilots Major Juan Cruzado de la Cruz y Mesa (†1692) and Francisco Antonio de Orbe (†1727). For the former see Pulido Rubio, *El piloto mayor de la Casa de la Contratación de Sevilla*, 867–905, and for the latter 907–945.

27 This is an expression coined by Brendecke, *Imperio e información*. Antonio Sánchez explores this process using the nautical chart as an object of study in Antonio Sánchez Martínez, “Artesanos, cartografía e imperio. La producción social de un instrumento náutico en el mundo ibérico, 1500–1650,” *Historia Crítica* 73 (July 2019): 21–41.

28 See footnote 2. I develop this idea by following Sánchez Martínez, “Artesanos, cartografía e imperio”; Leitão and Sánchez, “Zisel’s Thesis, Maritime Culture, and Iberian Science in Early Modern Europe”; Sánchez, “The ‘Empirical Turn’ in the Historiography of the Iberian and Atlantic Science in the Early Modern World”; Antonio Sánchez and Henrique Leitão, “Artisanal Culture in Early Modern Iberian and Atlantic Worlds,” *Centaurus* 60, no. 3 (August 2018): 135–140.

peculiarity that makes them (tentative) tools for controlling long-distance oceanic voyages.

Rutters of instruction were delivered as part of a set of legally binding documents called "Instruction" (*Instrucción*) that were given to the admiral of a fleet before it set sail. In addition to the rutter itself, the pages of the instruction contained other guidelines on various matters to be followed during the voyage.²⁹ Thus, these rutters were "imbued with a certain legal power"³⁰ and specified several duties (assigned to those responsible for the completion of the journey), together with the penalties for non-compliance. A common closing paragraph for these instructions was as follows:

You are commanded, *under pain of death*, not to enter any port during your voyage until you reach the port of San Juan de Ulua. And in order to reach it with the required brevity, you shall exercise extraordinary diligence, as is expected of you.³¹

It is difficult to know whether such a strict order was followed to the letter in every case. There is an obvious problem between the theory and practice of power in such a situation, as the mandate may be very clear on paper, but control over what happens on the ship gradually diminishes as it moves away from the port.³²

However, there is some documentary evidence that those in charge of the vessel were held accountable after the voyage. For example, the owner and *maestre* (Miguel de Ribas) and the pilot (Miguel de Hordiola [?]) of the *Aviso* ship *San Juan*, which completed its voyage to New Spain in 1582, were thoroughly interrogated at the Casa de la Contratación upon their

29 Lacerda and Moreno Madrid, "A Remarkable Collection of Rutters, 16th–18th Centuries," 4.

30 Lacerda and Moreno Madrid, "A Remarkable Collection of Rutters, 16th–18th Centuries," 4.

31 "Y asimismo se os manda *so pena de la vida* que no entreis en ningún puerto en el discurso de vuestro viage hasta entrar en el de San Juan del Ulua, y para llegar a el con la brevedad que se requiere areis extraordinaria diligencia como de vos se confia." Italics are my own. "Instrucion de lo que vos, Alonso de [...], maestre del barco nombrado San Antonio y vos Valerio de Solís, piloto del dicho varco, aveis de guardar en el viaje que aveis de hacer por mandado de Su Majestad a la Provincia de Nueva España, con despachos de Su Real servicio, la qual aveis de guardar en la manera siguiente" (1609), in AGI, Contratación, 4890. Transcribed in Lacerda and Moreno Madrid, "A Remarkable Collection of Rutters, 16th–18th Centuries," 15–16.

32 I have recently addressed this problem in relation to the circulation of cartographic information in José María Moreno Madrid, "Circulation and Contacts in Sixteenth Century New Cartography: Spain, Portugal and Italy," *Culture & History Digital Journal* 10, no. 2 (October 2021): e015. See also Alison D. Sandman, "Controlling Knowledge: Navigation, Cartography, and Secrecy in the Early Modern Spanish Atlantic," in *Science and Empire in the Atlantic World*, ed. J. Delbourgo and N. Dew (New York: Routledge, 2008), 31–51.

return.³³ As expected, the “voyage and navigation”³⁴ carried out both on the outward and return journeys was one of the key questions for them. But the Spanish institutions’ desire to control the high seas went beyond a mere interrogation.

The Archivo General de Indias has a set of pages—in a precarious state of preservation—entitled “Routes Followed on the Voyage by this *Aviso* Ship,” dated 1612, and written by a high-ranking crew member of the *Aviso* ship *Buen Jesús*.³⁵ The text describes the events of the voyage in detail, and it resembles more a logbook than a rutter—contrary to what the title might suggest. The characteristics and context of the document suggest that it could be one of the *relaciones particulares* that pilots and masters had to write by order of Philip II’s famous royal decree of 1575.³⁶ The information about the voyage contained in this document is of great interest, and a careful reading reveals some of the practices that were used to ensure that the navigation was carried out according to the pre-established indications. The first paragraph states:

Captain Juan Marín [...] ordered me to make a report of what had happened on the voyage. I was to do this in the presence of the people on board: *maestre*, pilot, and the other sailors and cabin boys who have embarked on board the ship. When the voyage is over, it shall be read in their presence, and they shall each sign it in their own name; and they shall swear to it when necessary.³⁷

These reports were not “secret” but were written publicly under the supervision of the entire crew, who had to ratify and sign them at the end of the voyage—regardless of rank. From the account itself, we know that the *Buen Jesús* successfully completed its transatlantic crossing, arriving at the Villa Rica of Veracruz in August 1612. Shortly before docking, the crew gathered around the document in question and then:

33 Archivo General de Simanas [AGS], Guerra y Marina, 124, Doc. 112.

34 “Viaje y navegación.” AGS, Guerra y Marina, 124, Doc. 112.

35 “Derotas del barco de aviso que se hisieron en el viage.” AGI, Contratación, 4890. Transcribed in Lacerda and Moreno Madrid, “A Remarkable Collection of Rutters, 16th–18th Centuries,” 18–22. Hereafter, the published transcription will be used.

36 AGI, Indiferente, 1956, L.1, f.266rv.

37 “El capitan Juan Marin, [...] me ordenó que donde oy día de la fecha tomase la raçon de lo que susediese en el biaje y en precencia de la jente que ba dentro, maestre y piloto, y los demas marineros y grumetes que ban enbarcados dentro en el nabio para que acabado el biaje en precencia de ellos se les lea y los firmen de sus nonbres para cada y quando que fuere menester lo juren.” Lacerda and Moreno Madrid, “A Remarkable Collection of Rutters, 16th–18th Centuries,” 18.

In the presence of the *maestre* Gonçalo Domingues, the owner of the ship, the pilot Sebastian Fernandes and all the sailors, they were given [the record of] all the *derrotas*³⁸ and things that happened during the voyage, which they saw being written [during the voyage]. They said that all that was written therein is true, and they swore to it, and they will say so whenever they are asked. The witnesses were Gonçalo Domingues, master; Sebastian Fernandes, pilot; Francisco Rodrigues, a pilot who served as a sailor; Cristóbal Ganicho (?), sailor (he said he did not know how to sign and asked a witness to sign for him); Pedro Montoya, sailor; Juan Dias, sailor; [damaged] Domingues, sailor; Rodrigo Suares, cabin boy (who asked someone [...] to sign for him); Simón Hernandes, cabin boy.³⁹

Far from being a mere formality, this signature sheet was reviewed and certified the following September 17 by the authorities of Villa Rica de Veracruz in a document entitled "Signature Acknowledgement."⁴⁰ It confirmed that the voyage had taken place as described in the report, which was confirmed by the signatures. This allowed the captain to be cleared of all charges:

The said Captain Joan Marín fulfilled the duty he had in the service of His Majesty, coming by night and day, managing his watch as a good seaman and knowledgeable person, and keeping vigilant at night with great care and diligence as he was obliged to do. And so it was declared for the record.⁴¹

38 In this context *derrota* could be translated as "journey" or "navigation." However, it has a connotation closer to the idea of "pathway over water" that makes it difficult to translate it properly.

39 "Y en precencia del maestro Gonçalo Domingues, dueño del barco, y piloto Sebastian Fernandes, y de toda la jente de mar se les lego todas las derrotas y cosas que an sudedido en el biaxe, como lo an bisto que se benia escribiendo, q dixerón que es berda todo que aqui esta escrito y lo juraron y lo diran cada y quando que les fuere preguntado, siendo testigos Gonçalo Domingues, maestro, y Sebastian Fernandes, piloto, y Francisco Rodrigues, piloto que ba en plaça de marinero, y Cristobal Ganicho (?), marinero, y dixo que no sabía firmar y rogo a un testigo que firme por el; Pedro Montoya, marinero, y Juan Dias, marinero y [damaged] [Do] mingues, marinero, y Rodrigo Suares, grumete, que rogó [damaged] que firmase por el; y Simon Hernandes, grumete." Lacerda and Moreno Madrid, "A Remarkable Collection of Rutters, 16th–18th Centuries," 22.

40 "Reconocimiento de firmas," AGI, Contratación, 489o.

41 "Y el dicho capitán Joan Marin cumplio con la obligacion que tenia a el servicio de Su Magestad biniendo de noche y de dia gobernando su quarto (?) como buen marinero y persona que lo entiende y belando de noche con mucho cuidado y dilixencia como tenia obligacion y asi lo declararon para que le conste." AGI, Contratación, 489o.

Several excerpts from the logbook also emphasize the importance of following the Instruction regarding the prescribed route. When, after several days of unfavorable weather, they reached an altitude of 18 degrees, it is reported that they “changed [their] *derrota* [...] in compliance with their instruction”;⁴² when they sighted the islands of La Deseada and La Antigua, they set out to pass by the northern side “to carry out the instruction”⁴³, and also when they saw the island of Cuba “they navigated according to the *derrota* ordered by the instruction.”⁴⁴

Last but not least, the text contains a very interesting detail about how the information about the route to be followed was managed among the crew itself:

Today, Sunday the fifth of August, I told the *Maestre* and the people on the ship where we were going. Until then I had hidden this [information] in case we met enemies and our misfortune was so great that we fell into their hands. So there would be no one to tell the enemy where we were going in the service of His Majesty, because it would be hidden only in my mouth, and it would not be so if many knew. As His Majesty’s servant, I have exercised this diligence. Now that we are out of the area where there could be enemies, I have announced it, and I read to the *maestre* the instruction that I brought along with the *derrotas*. He has seen that we have complied with it and that it is written here.⁴⁵

The ship left on June 13, so the instructions and the route were not revealed to the *maestre* and the rest of the crew until almost two months later. It can be assumed that the “guardian” of the instructions would have given

42 “Mudamos derrota [...] en cumplimiento de nuestra ystruicion.” Lacerda and Moreno Madrid, “A Remarkable Collection of Rutters, 16th–18th Centuries,” 19.

43 “Bide la tierra de la Deseada y Antigua ya mucha [damaged] buelta por pasar por la banda del norte por cumplir [damaged] [ins]truicion y mude derrota.” Lacerda and Moreno Madrid, “A Remarkable Collection of Rutters, 16th–18th Centuries,” 19.

44 “Y de allí gobernamos [damaged] [siguiendo la] derota que nos ordena la ystruicion.” Lacerda and Moreno Madrid, “A Remarkable Collection of Rutters, 16th–18th Centuries,” 20.

45 “Oy domingo sinco de agosto le manifeste al maestre y a la jente del barco adonde ybamos con nuestro biaxe, porque hasta aqui lo tenía oculto por si acaso topasemos enemigos y fuese nuestra desgracia tanta que tubiesemos de benir a sus manos que no ubiese quien manifestase al enemigo donde ybamos en serbicio de Su Majesta, porque en mi boca estaria oculto y entre tantos no podría. Como chriado de Su Majesta hice esta delijencia y agora porque estamos fuera de donde podria aber enemigos lo declare y le ley al maestre la ynstrucion que traya juntamente con las derotas, que la visto que [h]emos hecho y estan escritas aquí.” Lacerda and Moreno Madrid, “A Remarkable Collection of Rutters, 16th–18th Centuries,” 21.

indications to the captain and the pilots until that date, so that the voyage would unfold under prearranged conditions. Whether all this happened as reported is impossible to know. In any case, this text perfectly illustrates the attempts at control on the high seas, a space that remained difficult for the empire's institutional tentacles to reach.

3.2. Systematic Voyages, Systematic Rules

Although they eventually acquired a rhetoric of their own, the instructions and accompanying rutters of instruction were documents issued for specific journeys with adapted directions. Nevertheless, the regulation of long-distance oceanic voyages and the exact route to be followed constituted a matter of such significance that it was also addressed in more general compilations of laws.

For example, Ordinance 174 of the Casa de la Contratación of Seville stipulates, in rather general terms, the obligation of the ship to follow its route without deviation until it reaches its destination: “*Item*. From the moment of departure from the bar and port of Sanlúcar, the voyage will proceed directly to any location within the Indies where the aforementioned vessel has been dispatched.”⁴⁶ Somewhat more detailed is the seventh chapter of the “Instruction of the *Juez Oficial*,” promulgated by Charles V, whose descriptor indicates that the *Juez Oficial* must “proclaim that the ships wait and salute the captain, [...] and do not change its *derrota* without license.”⁴⁷ However, it was the “Instruction to Generals and Admirals” issued by Philip II in 1597 that regulated with particular caution the vicissitudes associated with the standardization of ocean routes. Chapter 16 describes the general's duties before and during navigation,⁴⁸ and specifies how he should respond to a request to change the route during the voyage:

46 “*Maestres, desde la hora que saliere de Sanlúcar vaya derecho para donde se fletó, y lo que se debe hacer*. Ytem. Que desde la hora que hiziere vela de la barra y puerto de Sanlúcar, aya de yr derechamente en qualesquier partes de las Indias donde alli fuere fletada la tal nao,” *Ordenanças reales para la Casa de la Contractacion de Seuilla y para otras cosas de las Indias y de la nauegacion y contractacio[n] dellas* (Sevilla: En casa de Martín de Montesdoca, 1553).

47 “Pregonar que las naos aguarden y saluden a la capitana, y tomen el nombre y no muden derrota sin licencia.” This law was updated under the reign of Charles II (1661–1700), adjusting the punishment to that contained in the “Instruction of Generals” of 1674. Book IX, Title V, Law X of the *Recopilación de leyes de los Reinos de las Indias, mandadas imprimir y publicar por La Magestad Católica del Rey Don Carlos II, Nuestro Señor*, vol. III (Madrid: Boix, 1841), 178.

48 “Instrucción a generales, almirantes, etc: armadas de Indias,” AGI, Patronato, 260, N.1, R.30, f.3v.

Any pilot who, while navigating, thinks it would be good for the admiral's ship to change the *derrota*, should say so freely. The general, having understood the reason for which he says so and having consulted with him, will provide and command what is most convenient.⁴⁹

While it is true that the general had the final say on the route, the authority of the pilots in this matter cannot be overlooked, since the order does not refer specifically to the pilot major of the fleet, but to *any* of the pilots in the fleet. This chapter is supplemented by the twenty-first, in which the monarch orders the fleet to "endeavor to follow its route with all possible haste."⁵⁰

Where there are obligations, there are penalties for noncompliance. Chapter 17 denounces that the generals do not apply the penalties specified in their Instructions with sufficient severity, resulting in:

many ships *derrotados*⁵¹ and departed from their flagship without the influence of a storm or any other motive, but with malice. And so many of them have fallen into the hands of the enemy. They are bait for the corsairs, who are becoming more and more numerous for this reason, and cause other great damage.⁵²

These instructions of Philip II also include some chapters dedicated to the regulation of specific routes. This is the case of chapter 35, which sets out in great detail the route to be followed and the obligations of the generals who would command the fleets to New Spain.⁵³ For the return trip, since unforeseen events were more likely to occur, greater flexibility was allowed

49 "[...] A qualquier piloto que durante la navegación le pareciere que es bien que la capitana mude alguna derrota lo diga libremente, para que entendida la causa que da y conferido sobre ello el genera provea y mande lo que más convenga." "Instrucción a generales, almirantes, etc: armadas de Indias," AGI, Patronato, 260, N.1, R.30, f.4r.

50 "Haviendo salido de la barra capitana y Almiranta y las demás naos que han de yr el biaje procurará seguir su derrota con toda la priesa que el tiempo le diere lugar ..." "Instrucción a generales, almirantes, etc: armadas de Indias," AGI, Patronato, 260, N.1, R.30, f.4v.

51 *Derrotarse*. In this context, this expression literally means "to turn away from its *derrota*."

52 "Que muchas naos se derroten y aparten de su capitana sin tormenta ni ocasion sino con malicia [...], y ansi han venido muchos dellos a poder de enmigos que es causa que los corsarios con este cebo crezcan y aya más, y de otros grandes daños." "Instrucción a generales, almirantes, etc: armadas de Indias," AGI, Patronato, 260, N.1, R.30, f.4r.

53 "Instrucción a generales, almirantes, etc: armadas de Indias," AGI, Patronato, 260, N.1, R.30, ff.7v–8r. In the margin of the folio, next to this chapter, is a *corrigendum* for the ships bound for Honduras. It is a brief text, which makes three or four adjustments to the "official" route to avoid the risk of hurricanes and corsairs. Brief but relevant, as it reflects that nautical safety issues were constantly being updated.

in preparing the way back to the Iberian Peninsula: "In order to better ensure the success of their voyage, they will meet and, with the consent of their admirals and pilots major, they will make an instruction of the navigation that they should do."⁵⁴

In the preparation of this new "Instruction of Navigation," the types of flags swarming the ocean were taken into due consideration. Indeed, the encounter with corsairs or enemy ships on the high seas was one of the greatest concerns of the Spanish institutions. A possible confrontation could result in great human and economic losses. For this reason, Philip II insisted on a policy of "the more precautions, the better," fully accepting a change of *derrota* if necessary. If the news of corsairs arrived when the ship had not yet left the Indies, a meeting should be held with the participation of the admiral, *veedor*, captains, *maestre*, and pilots of the fleet. They would be joined by royal officers and other judicial officials. If they were in New Spain, the results of this meeting had to be reported to the viceroy and the royal *audiencia*.⁵⁵ Needless to say, the possibility of "changing the *derrota* at sea" was one of the issues discussed.⁵⁶ If, however, word of the corsairs came only after the ship had already reached the high seas, the change of the *derrota* would be both inevitable, and adopted on the fly. Philip II's instruction also had an answer for this eventuality:

The people of the navy and fleet will assemble, and they will discuss the *derrota* they should follow so as not to meet the enemy; and they will follow it. If it is convenient to arrive at any part or port of the Indies—or the islands of the Azores, or Canary Islands, or Spain—depending on where they are at the time they have the notice [of the corsairs], they will try to go to the part and port that seems most appropriate to be able to defend themselves from the enemy (if they are attacked). [It will also be] a good place to provide and supply themselves with what is lacking, [where they will be able to wait] until they give us notice of what has happened and they are ordered to do what they have to do. Everything

54 "Y para que mejor se acierte el buen subceso de su viaje, se juntaran entrambo y con acuerdo de sus almirantes y pilotos mayores harán una instrucción de la navegación que deven traer ..." "Instrucción a generales, almirantes, etc: armadas de Indias," chapter 102, AGI, Patronato, 260, N.1, R.30, ff.22v.

55 "Instrucción a generales, almirantes, etc: armadas de Indias," Capítulo 87, AGI, Patronato, 260, N.1, R.30, ff.19r.

56 "[...] en la mar mudar derota." "Instrucción a generales, almirantes, etc: armadas de Indias," Capítulo 87, AGI, Patronato, 260, N.1, R.30, ff.19r.

that happens in this regard is to be recorded by the royal scribe so that we may know what has happened.⁵⁷

As can be seen, the entire process that took place after the enemies were sighted and had to be verified by the royal scribe who traveled on board, including the change of *derrota*. This perfectly reflects the ambition of the Hispanic Monarchy to always have the *entera noticia* of everything that happened, even on the high seas. All these instructions, together with the “Ordenanzas of the Casa de la Contratación” and the “Instruction of the *Juez Oficial*” compiled by Charles V, were collected in the *Recopilación de leyes de los Reinos de las Indias*, published in 1681 after an encyclopedic effort of compilation and codification.⁵⁸

Needless to say, Portugal had also developed legal instruments and mechanisms to control oceanic voyages by the early modern period. One of the most interesting examples is the “Law on How Ships Sailing from these Kingdoms Are to Be Equipped,”⁵⁹ issued by King Sebastião in 1571. Several of its pages are dedicated to the regulation of the routes that connected Lisbon with the Portuguese overseas territories. The admirals⁶⁰ of the fleets set out with an Instruction, or *regimento*, specifying the route they were to follow. Consequently, to deviate meant to violate what was indicated in such documents, which were also endowed with a certain legal power. In the case of ships bound for São Tome, King Sebastião addressed the problem as follows:

If it is desired to change the path and *derrota* because of something that happens or because it is considered better, the opinion of the pilots and *mestres* of the other ships will be taken. It will be done what seems best

57 “Si esta nueva la tuvieren en la mar harán junta con la gente de su armada y flota, y trataran la derrota que pueden traer para no encontrarse con el enemigo, y aquella seguiran, y si conviniere arribar a alguna parte, o puerto de las Indias, o de las yslas de los Açores, o Canaria, o a España según donde se hallaren al tiempo que tuvieren el aviso procurará que sea a la parte y puerto que pareciere mas a proposito y suficiente para poderse deffender del enemigo si acaso fuesse sobre el, y proveerse y basteçerse de mantenimientos, y de lo que faltare, hasta que nos de aviso y se le provea y ordene lo que ha de hazer, y todo lo que en esto passare se haga ante su escrivano Real para que sepamos lo que en ello huviesse pasado.” “Instrucción a generales, almirantes, etc: armadas de Indias,” chapter 90, AGI, Patronato, 260, N.1, R.30, f.17v.

58 See Brendecke, *Imperio e información*, 347–58.

59 “Ley de como ham de jr armados os navios que destes reynos nauegarem.” I use the transcription published in *Portugal e o século XVI: Leis sobre a navegação e possessões do Império. Lisboa 1570–1573* (Lisboa: Divisão de Publicações e Biblioteca-Agência Geral das Colónias, 1943).

60 In Portuguese *capitão-mor*.

to all or to the majority of them. And all will always be obliged to follow it, both on the way out and on the way back, without deviating.⁶¹

If, for any reason, a ship deviated from its course in defiance of the admiral's orders, the law required him to record everything that happened so that the judicial authorities could later "proceed against the guilty, and punish them according to their fault."⁶² Those who disobey, the law states, would be imprisoned and punished as they deserve, whether they be the pilot, the captain, the sailors, or any other person involved in the infringement. However, it seems that King Sebastião was a bit more lenient when it came to punishment, since the sanction in this case would not be the death penalty, but a substantial fine.⁶³

Conclusion

The Iberian maritime expansion of the sixteenth century shook the legal landscape of the time regarding the dominion of the seas. Portugal and Spain reached territories accessible only by sailing, which required systematic long-distance oceanic voyages to be controlled and profitable. In this sense, it was not so much a question of adapting the maritime voyages to an international legal framework as of fortifying the instruments for controlling the way in which these journeys were carried out. It was necessary to protect and regulate, as much as possible, the maritime routes on which the stability and advancement of the empire depended. This claim caused the "route," understood as a regulatable entity, to strengthen its presence in legal documents throughout the sixteenth century. As has been argued, several mechanisms were developed for this purpose. The complexity and scale of the maritime imperial enterprise meant that laws and rules of a

61 "E quando quiser mudar o caminho & derrota que levar por qualquer caso que aconteça, ou por aver assi por melhor, tomara o parecer dos Pilotos & mestres dos outros Navios, & o que a todos, ou á mayor parte delles parecerer se fará, & seram todos obrigados a sempre o seguir, assi á hida como á vinda, sem nenhum delles se apartar." *Portugal e o século XVI*, 24.

62 "[...] Fará o Capitam mór fazer de tudo autos que entregera ás Iustças a que pertencer, pera se proceder contra os culpados & serem castigados conforme as suas culpas." *Portugal e o século XVI*, 24.

63 "Sob pena de serem por isso presos & castigados como o caso merecer, assi o Piloto & Mestre do Navio, ou Navios que se apartarem, como os Marinheyros & mays gente delles, que nisso forem culpados, & sendo condenados em pena de dinheyro se auera pelloos fretes dos taes Navios & por suas fazendas." *Portugal e o século XVI*, 24.

more general nature had to coexist with others designed specifically for a particular voyage—all with their punitive component.

The limits to the effectiveness of these laws, as in so many other aspects of early modern maritime expansion, were set by the reality of life on the high seas. Once the ship was lost sight of beyond the horizon, control over it was drastically reduced. For the purposes of this chapter, however, this is beside the point. What has been emphasized instead is the complexity of the process of producing novel legal devices that sought remote control *in all its aspects*,⁶⁴ with the conviction that it could be achieved. I believe that the documentation presented in this chapter illustrates a new mentality when it comes to organizing and thinking about institutional power, typical of the overseas empires of the modern era. They seem, moreover, to indicate that the control, regulation, and management of such peculiar entities as long-distance oceanic routes was one of the greatest challenges posed by the “change of scale” of the sixteenth century.

Acknowledgments

The author is grateful to Henrique Leitão, David Salomoni, and Šima Krtalić for their careful review of earlier versions of this text and their valuable suggestions for improvement.

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64 Law, “On the Methods of Long-Distance Control,” 235.

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4. Traveling with and Updating “Secret” Knowledge: Van Linschoten and Iberian Nautical Rutters (1583–1596)

Nuno Vila-Santa

Abstract: This chapter documents the historical significance of nautical rutters in maritime knowledge circulation and their impact on European empires, focusing on Dutch traveler Jan Huyghen van Linschoten (1563–1611). It describes how Van Linschoten obtained and published Portuguese and Spanish nautical rutters in the Dutch Republic in 1595–1596, which catalyzed Dutch expansion to Asia. The chapter examines his movements during his Iberian career and emphasizes the transformation of Iberian nautical rutters into cohesive maritime knowledge for navigators. Rather than a mere spy, Van Linschoten is viewed as a facilitator of knowledge transfer between Iberia and Northern Europe. Ultimately, the chapter highlights the broader relevance of nautical rutters for early modern global and imperial historians.

Keywords: espionage, Dutch Republic, maritime knowledge, information, Portugal, Spain

Introduction

A new phase in world history began when Europeans started navigating at a truly global scale. This process was already underway in the fifteenth century and intensified at the turn of the sixteenth century. Discovery of the main sailing routes to the American continent, to India, and the first circumnavigation of the world itself were all critical in the building of the first global maritime empires, spearheaded by the Portuguese and Spanish

crowns.¹ Nautical rutters—technical documents explaining how to navigate oceanic routes successfully—were a key element in this development. Mastering oceanic routes rapidly became the way to control the sea, global communications, and connectivity between different geographical spaces, and formed the foundation for all the European maritime powers of the early modern period. For this reason, scholarly attention has recently turned to comparative approaches concerning the building of maritime empires, from antiquity to the early modern period.²

Still, the vital role played by nautical rutters in the European maritime expansion and the history of science in general has not yet been fully recognized. While some research has been conducted on the historical specificities of nautical rutters, their contents, and their evolution, systematic studies are lacking. One way forward is to tackle rutters in tandem with investigations into the “carriers” of such nautical knowledge, approaching them through the lenses of the history of knowledge and history of science.³ Within this framework, Jan Huygen van Linschoten (1563–1611) is among the most interesting cases for the sixteenth century, known for having published, in the Dutch Republic, a compilation of Iberian nautical rutters that decisively influenced the Dutch, English, and French maritime expansion of the seventeenth century. The *Reys-gheschrift*, a section of the first Dutch edition of Van Linschoten’s *Itinerario* (printed in 1596), detailed the most important Atlantic, Indian, and Pacific Ocean sailing routes of the time. It constituted the earliest systematized compilation to be published of nautical data for navigating all three of the earth’s main oceans. The urgent need for such information is clear—in 1595, before the release of the full *Intinerario*, the *Reys-gheschrift* was printed and given to Cornelis de Houtman (1565–1599), commander of the first Dutch expedition to Asia.

The *Itinerario* (and the *Reys-gheschrift* in particular) likewise quickly caught the attention of other Northern European powers. In England, Richard Hakluyt (1553–1616), advisor to Queen Elizabeth I (1558–1603) and

1 On this topic see the recent volume Ivonne del Valle, Anna More, and Rachel Sarah O’Toole, eds., *Iberian Empires and the Roots of Globalization* (Nashville: Vanderbilt University Press, 2019).

2 See the volume Rolf Strootman, Floris van den Eijnde, and Roy van Wijk, eds., *Empires of the Sea: Maritime Networks in World History* (Leiden: Brill, 2020).

3 Following the proposals of Peter Burke, *A Social History of Knowledge: From Gutenberg to Diderot* (Cambridge: Polity Press, 2008); James A. Secord, “Knowledge in Transit,” *Isis* 95, no. 4 (December 2004): 654–672; Lorraine Daston, “The History of Science and the History of Knowledge,” *Know* 1, no. 1 (Spring 2017): 131–154; Johan Östling et al., “The History of Knowledge and the Circulation of Knowledge: An Introduction” in *Circulation of Knowledge: Explorations in the History of Knowledge*, ed. Johan Östling et al. (Lund: Nordic Academic Press, 2018), 9–33.

a leading supporter of overseas expansion, immediately ordered that the *Itinerario* be translated. The resulting English version, edited by John Wolfe and published just two years after the 1596 Dutch release, was the *Itinerario*'s first appearance in translation. Hakluyt also translated Van Linschoten's nautical rutters for his 1600 volume entitled *The Principal Navigations of the English Nation*. In 1599 and 1600, Latin and German editions of the *Itinerario* were issued, and some ten years later, the first French edition went to press. The *Itinerario*, and even the *Reys-gheschrift* alone, continued to be reprinted during the seventeenth century,⁴ and estimates point to the existence of roughly ten to fifteen thousand copies in circulation during that period.⁵ In light of these circumstances, it is hardly surprising that the *Itinerario* has long been discussed by historians.⁶

This chapter will address three main topics. The first pertains to the prevailing scholarly view on Van Linschoten (that is, as a Dutch spy sent to plunder Iberian knowledge), and asks whether solid ground exists for this longstanding opinion. Developing this theme, the chapter then explores whether, or how, a Dutch spy would have been able to build a career spanning two worlds at war—Spain under Philip II, and the emergent Dutch Republic. In practical terms, how might Van Linschoten have acquired this sort of "secret knowledge" (as nautical rutters were considered to be in both Spain and Portugal), and brought it safely back to the Dutch Republic? Finally, I consider ways Van Linschoten's Iberian source material might have been updated to fit the goals of the first Dutch publication.

This chapter thus aligns itself with recent historiographic appeals to study how knowledge is transformed by its circulation.⁷ It attempts to demonstrate that the characterization of Jan Huygen as a spy is too simplistic for his multifaceted personality and career. Indeed, underneath this "typical case" of knowledge circulation is a much more complex history of information exchange within Europe, and between Europe and Asia.

4 For an immediate visualization of all editions of the *Itinerario*, the *Reys-gheschrift* and the *Beschryvinge* see: <https://www.aseaofbooks.org/#linschotens-itinerario>.

5 Adrien Delmas, "L'*Itinerario* de J. H. van Linschoten, ou l'histoire d'un divorce entre le livre et la Compagnie Hollandaise des Indes Orientales (VOC), 1595–1619," *Quaerendo* 42, no. 1 (2012): 13.

6 For a recent reassessment on Linschoten's scholarship see: Nuno Vila-Santa, "Jan Huygen van Linschoten (1563–1611): An Annotated Bibliography," *RUTTER Technical Notes* (2021): I. <https://doi.org/10.6084/m9.figshare.14931945.v1>; https://rutter-project.org/wp-content/uploads/2021/09/vila-santa_tn9.pdf

7 By James Secord and more recently by Johan Östling, David Larsson Heidenblad, Erling Sandmo, Anna Nilsson Hammar and Kari H. Nordberg. See note 4.

4.1. Acquiring “Secret” Knowledge in Iberian Service: Van Linschoten and the Future *Itinerario* (1583–1592)

Born to a Catholic family in Haarlem in 1563, Van Linschoten’s childhood was profoundly affected by the beginning of the Dutch rebellion (starting in 1566) against King Philip II (1556–1598). When Spanish forces retook the city in 1572, his family was forced to leave Haarlem. After settling in Enkhuizen, Jan Huygen spent his youth helping run the family tavern, where he heard many stories of travels in Europe, the Americas, and Asia, and watched his father lending money to ship-owners. In 1579, Van Linschoten departed from Enkhuizen for Spain, but there is no documentary evidence suggesting he had been hired by the Dutch rebel leaders as a spy. Several studies have already made this point;⁸ the Union of Utrecht (which triggered the foundation of the Dutch Republic) had only happened in 1578, and the Dutch rebellion was still fighting for survival.⁹ Contrary to the classic “spy mission” narrative (for which no documents are known), it was Van Linschoten’s will to know and explore the world, as he states in the *Itinerario*, that motivated him to travel.¹⁰ Such “curiosity” was very common in those days, not only in the cultural ambience of the Low Countries, but more generally in other parts of Europe.

After a short period in Seville in 1580, the Dutchman arrived in Portugal, where he learned Portuguese while serving in the merchant houses of Lisbon. As discussed elsewhere,¹¹ in 1583 Van Linschoten was likely chosen to be the accountant of Vicente da Fonseca (?–1588), the archbishop of Goa, who was appointed by Philip II to sail to India. Rapidly winning Fonseca’s trust, and already in Goa, Van Linschoten was soon promoted to the position of his secretary. In light of Fonseca’s confidence, it is probable that the archbishop charged Van Linschoten with the writing of a major cosmographical work to be sent to King Philip II. The objective of the assignment: to inform the recently crowned king of Portugal on the details of his possessions in Asia.

8 *Itinerário, viagem ou navegação de Jan Huygen van Linschoten para as Índias Orientais ou Portuguesas*, ed. Arie Pos and Rui Manuel Loureiro (Lisbon: CNCDP, 1997), 35–36; Ernst van den Boogaart, *Jan Huygen van Linschoten and the Moral Map of Asia* (London: The Roxburghe Club, 1999), 3.

9 Jonathan Israel, *The Dutch Republic: Its Rise, Greatness, and Fall, 1477–1806* (Oxford: Clarendon Press, 1995), 184–194.

10 *Itinerário*, 57 and 69.

11 Nuno Vila-Santa, *Knowledge Exchanges between Portugal and Europe: Maritime Diplomacy, Espionage, and Nautical Science in the Early Modern World (15th–17th Centuries)* (Amsterdam: Amsterdam University Press, 2024), 273–276.

In this way, the Dutchman's task was analogous to that of the anonymous author of a work from 1582, likewise dedicated to Philip II, which attempted an overview of the structure of Portuguese dominions in Asia.¹²

A brief note on the office of archbishop is warranted at this point. Ever since the arrival of the first archbishop of Goa in 1559, the position had been endowed with considerable temporal powers. Indeed, the earliest person to hold the office—Gaspar de Leão Pereira—deposed a viceroy of India in 1573, at the orders of King Sebastião (1557–1578).¹³ Moreover, Goa's archbishops were regularly called upon to offer political advice to the Portuguese rulers of India. Such factors render plausible the hypothesis that King Philip II charged Fonseca before his departure to India with compiling and sending a work detailing his dominions in Asia. Once in Goa, this likely contributed to Fonseca's request of the Portuguese viceroys of India that Van Linschoten be given access to several documents. While denial of an archbishop's request would have been unlikely, even had a viceroy demurred, it is to be recalled that Fonseca exercised provisional rule of Goa twice: in 1583–1584 and 1585.¹⁴ Thus, on at least those two occasions (if not on others, and in the course of his duties as Fonseca's secretary), the Dutchman was given privileged access to the viceroy's palace, and he acquired a familiarity with it that is readily confirmed by his descriptions in the *Itinerario*.¹⁵

The most important Portuguese administrative documents were archived at the viceroy's palace in Goa. Filed among them were the sort of nautical rutters that Van Linschoten would later publish, and to which foreigners were typically denied access. Knowing his audience, Fonseca may have charged Van Linschoten with compiling these navigational texts for inclusion in the book to be sent to Philip II. After all, the new monarch had a well-known obsession with the acquisition and organization of data concerning his empire,¹⁶ amply evident in both his correspondence and the library at El Escorial.¹⁷ The notion that Jan Huygen accessed rutters through

12 *Livro das cidades, e fortalezas, que a Coroa de Portugal tem nas partes da Índia, e das capitãtias, e mais cargos que nelas ha, e da importancia deles*, ed. Francisco Paulo Mendes da Luz (Lisbon: Centro de Estudos Históricos Ultramarinos, 1960).

13 Nuno Vila-Santa, "Revisitando o Estado da Índia nos anos de 1571 a 1577," *Revista de Cultura* 36 (2010): 95–97.

14 Diogo do Couto, *Da Ásia* (Lisboa: Régia Officina Typográfica, 1787), Década X, book iv, 436 and book vi, 460.

15 *Itinerário*, 161 and 300.

16 On the topic see: Arndt Brendecke, *Imperio y información. Funciones del saber en el dominio colonial español* (Madrid: Iberoamericana; Frankfurt: Vervuert, 2016).

17 María M. Portuondo, "The Study of Nature, Philosophy, and the Royal Library of San Lorenzo of the Escorial," *Renaissance Quarterly* 63, no. 4 (Winter 2010): 1106–1150.

officially sanctioned channels is further supported by the simple fact that subterfuge and surreptitious access would be difficult to achieve—in Goa, the Dutchman stood out racially (as both his portrait and the *Itinerario*'s famous depiction of the Goa market evidence). Furthermore, the idea that for five years Van Linschoten could have successfully deceived not only his master, but the entire Portuguese system, strains credibility. During the years the Dutchman spent in Goa, news of the Dutch rebellion was discussed with keen interest and concern, having triggered fears of a Protestant Reformation in Portugal and its empire. This anxiety played a part in the arrival of the Portuguese Inquisition in Goa, in 1559–1560. Van Linschoten himself had a more than passing awareness of the persecution of Flemings, Dutchmen, and Germans (for alleged Protestantism) in India.¹⁸ In the *Itinerario*, he commented that several Dutchmen had been forced to flee Goa for the nearby Bijapur sultanate due to Goa's Inquisition policies.¹⁹ This ambiance of heightened paranoia and scrutiny of foreigners makes it still more unlikely that Jan Huygen could have consulted documents by subterfuge, tricking his master (who had personal powers over the Goa's Inquisition) and Portuguese authorities. Most importantly, Jan Huygen's conversion to Calvinism (only taking place in 1595)²⁰ strongly suggests that he had previously been a Catholic, like his family members.²¹

Fonseca's open trust would also have given Van Linschoten the conditions to compile other nautical and geographical data archived outside the vice-roy's palace, through personal interactions with captains, merchants, and missionaries. A careful reading of the *Itinerario* permits the identification of likely informants for several topics.²²

Things changed for Jan Huygen with the departure of the archbishop to Lisbon in late 1587. Several further developments would solidify Van Linschoten's resolve to return to the Low Countries. In September 1588, he received news of the death of his father and one of his brothers. Around the same time, the Dutchmen got word that Fonseca had died, and that an Iberian Armada had been sent against England by King Philip II. With

18 John Everaert, "Soldiers, Diamonds and Jesuits: Flemings and Dutchmen in Portuguese India (1505–90)," in *Vasco da Gama and the Linking of Europe and Asia*, ed. Anthony R. Disney and Emily Booth (New Delhi: Oxford University Press, 2000), 90.

19 *Itinerário*, 297.

20 Cornelis Koeman, "Jan Huygen Van Linschoten," *Revista da Universidade de Coimbra* XXXII (1985): 37.

21 Charles McKew Parr, *Jan van Linschoten: The Dutch Marco Polo* (New York: Thomas Y. Crowell Company, 1964), 34.

22 On the topic see: Vila-Santa, *Knowledge Exchanges*, 277–282.

Elizabethan England openly supporting the Dutch rebellion against King Philip II at that moment, Van Linschoten had reasonable fears about remaining in India unemployed and without Fonseca's protection. The archbishop's patronage had at times been essential. In 1584, for example, Fonseca had helped clear Jan Huygen's name following the escape of three Englishmen from a Goan prison. Since Van Linschoten had previously supported their release, their flight had turned suspicious eyes onto the Dutchman.²³ With a new archbishop entering office in Goa and heading up the local Inquisition, Van Linschoten, in his now-tenuous position, could easily risk loss of life if his nationality were used to levy accusations of heresy, or even espionage. The question, however, remains: how could Van Linschoten have secured authorization to depart with the "secret knowledge," such as nautical rutters, that he had been openly collecting?

It is likely that after Fonseca's death, Van Linschoten persuaded Manuel de Sousa Coutinho (1588–1591), the Portuguese governor of India, that he would present his work to Cardinal Albert of Austria (1559–1621), the viceroy of Portugal from 1583 to 1593, whose coat of arms Van Linschoten included in his famous map of Goa. Jan Huygen was already close to Coutinho, having met him previously and personally attending the ceremony in which he assumed his powers as ruler of Portuguese Asia. Coutinho is singled out, moreover, for particular praise in the *Itinerario*.²⁴ Surviving letters by Coutinho²⁵ suggest that the Dutchman had promised to aid him with the pepper load of vessel *Santa Cruz*. Relying upon the fame of his Dutch friend Dirck Gerritsz Pomp, who was also returning to Lisbon, and his contacts with the Fugger and Welser's merchant houses in India, Van Linschoten won the appointment of pepper overseer on the same ship. Afterwards, he secured a safe conduct signed by Coutinho permitting him to return to Portugal, as is stated in the *Itinerario*.²⁶

The voyage back to Europe, begun in 1589, was traumatic. Van Linschoten feared for his life on multiple occasions, and was forced to anchor and remain in Angra, one of the Azores islands, for two years. As had been the case in Goa, however, Van Linschoten was given extraordinary privileges during this stay, this time from Juan de Urbina, the Spanish governor of the island. Despite the war between Spain and the Dutch Republic and the general distrust of foreigners in Angra, Urbina allowed Van Linschoten to explore

23 *Itinerário*, 279–282.

24 *Itinerário*, 300.

25 For more details: Vila-Santa, *Knowledge Exchanges*, 290–291.

26 *Itinerário*, 300.

the island on horseback on two occasions (something not even permitted to men born in Terceira, as Jan Huygen records in the *Itinerario*).²⁷ Clearly, Van Linschoten had been able to win Urbina's trust. He likely furthered this relationship by presenting some or all of the work he had completed in Fonseca's service to Urbina. Such a possibility (and the resulting recognition of Van Linschoten's talents) would explain Urbina's request that he produce an up-to-date depiction of Angra and Terceira. Although the Dutchman ultimately only depicted Angra, he likely had the support of a team of skilled cartographers, perhaps including the Portuguese chart maker Luís Teixeira (?–1604), as Humberto Oliveira has argued.²⁸ Van Linschoten was not a trained cartographer (as he openly admitted in the initial pages of the *Itinerario*),²⁹ and the detailed chart of Angra would certainly have required the help of experts. In the course of this project, and profiting from Urbina's confidence, the Dutchman may have secured still more cartographic information while in Angra, later to be brought to the Dutch Republic. However, this hypothesis remains speculative in the absence of documentary evidence.

Judging the Dutchman to be a faithful servant of the Iberian monarch, Urbina delivered the depiction of Angra to King Philip II as soon as he received it. Van Linschoten also kept a secret copy, as he stated himself, which later appeared in the *Itinerario*. In the meantime, Jan Huygen continued to enjoy good conditions for gathering nautical knowledge when he was asked to act as an interpreter for some English prisoners.³⁰ His role as a translator between the Iberians and the English in Angra was, in broad strokes, a repetition of the 1584 negotiations concerning jailed Englishmen in Goa. The Dutchman also took the opportunity to gather more nautical knowledge from Portuguese and Spanish seafarers, and very likely used his two-year stay in Angra to start writing parts of the *Itinerario*.³¹ When Van Linschoten sailed to Lisbon in late 1591, it is highly probable that, instead of presenting his work to Cardinal Albert of Austria, the viceroy of Portugal, he was convinced by Dutch merchants to publish his work in the Dutch Republic. The same community of merchants had provided valuable information to the Houtman brothers (Cornelis and Frederick) around the same time. The Houtmans had been charged by Petrus Plancius (1552–1622), head of the

27 *Itinerário*, 341 and 344.

28 Humberto Oliveira, *Angra na visão de Linschoten* (n.p.: Turiscon Editora, 2020), 428–435.

29 *Itinerário*, 65.

30 *Itinerário*, 341 and 344.

31 McKew Parr, *Jan van Linschoten*, 117.

Dutch espionage network, with acquiring the "secret" Portuguese nautical rutters kept in Lisbon.³² Aware of the Dutch Republic's plans to launch an overseas expansion and stage a worldwide maritime war against King Philip II, as Queen Elizabeth I had done with success in the previous years, Lisbon-based Dutch merchants may have convinced Jan Huygen that he would personally profit more by publishing his work in the Low Countries. The Dutchman's hesitation during this turning point in his career can be inferred by a close reading of the *Itinerario*, in which he recalls spending seven months in Lisbon (January–July 1592) taking care of his affairs as royal overseer.³³ In reality, it is improbable that Van Linschoten had used the Lisbon sojourn merely to attend to these business matters. Indeed, he may even have been in contact with the Houtman brothers. Unfortunately, no known documentary reference has survived to confirm this hypothesis. Still, Erik Odegard's forthcoming study of the documents from the Houtmans' 1592 mission in Lisbon, held at the Amsterdam Maritime Museum, unequivocally proves Van Linschoten's later acquaintance with the brothers. Nor is it to be forgotten that after arriving in the Dutch Republic, Jan Huygen worked up nautical documents for Cornelis de Houtman's inaugural voyage to Asia.³⁴

A recent study, citing the Dutchman's well-known criticism of the Portuguese system in Asia, has suggested that Van Linschoten might have become a spy (or at least, anti-Portuguese) while in Goa.³⁵ Such an interpretation overlooks several other passages in the *Itinerario*, however, in which Jan Huygen discloses admiration for the Portuguese and the Spanish.³⁶ It is far likelier to have been in 1592, in Lisbon, that the Dutchman at last decided to strive for the career he had hoped for in Portuguese Asia within the Dutch Republic. At this stage, it is important to remember Van Linschoten's comments on his choice to leave Goa. As he stated in the *Itinerario*, it had been a difficult decision; he had even, at times, considered settling in India permanently, and had expected a promotion had Archbishop Fonseca returned.³⁷ Such admissions undermine the notion that Jan Huygen had

32 Arun Saldanha, "The Itineraries of Geography: Jan Huygen van Linschoten's *Itinerario* and Dutch Expeditions to the Indian Ocean, 1594–1602," *Annals of the Association of American Geographers* 101 (2011): 168; Delmas, "L'*Itinerario* de J. H. van Linschoten," 9.

33 *Itinerario*, 358.

34 See Erik Odegard, "To Go There and Back Again: Preparations for the First Dutch Voyage to Asia, 1592–1595," forthcoming.

35 William Blanke Elgin, "The Itinerary of Jan Huygen van Linschoten: Knowledge, Commerce and the Creation of the Dutch and English Trade Empires" (MA thesis, Miami University, Oxford, OH, 2021), 16–25.

36 For more details: Vila-Santa, *Knowledge Exchanges*, 303–309.

37 *Itinerario*, 73–74.

been acting as a spy for the Dutch supreme leadership during his time in Portuguese Asia, or even in Angra. Nor is any formal letter enlisting him in espionage from the Dutch leaders—Prince Maurice of Nassau (1567–1625) and Johan van Oldenbarnevelt (1547–1619)—known to exist.

4.2. Returning to the Homeland (1592–1596): The Editions of the *Itinerario* and the *Reys-gheschrift*

Thus, until Van Linschoten's return to Enkhuizen, in September 1592, there is apparently no documentary evidence that he was ever asked to become a spy. Quite the opposite: all surviving data points to the likelihood that the future *Itinerario* had originally been conceived as major cosmographical work to be published in the Iberian world. This last idea is further reinforced by an analysis of how the various sections of the *Itinerario*—that is, the *Itinerario* proper, the *Beschryvinge* (or American-African section), the *Reys-gheschrift* (the compilation of sailing rutters), and even the *Extract* (an overview of the Portuguese and Spanish crown revenues)—were reshaped for a Dutch audience. This “relocalization” has been the topic of several studies,³⁸ and drew in figures ranging from the physician Bernardus Paludanus (1550–1633) and editor Cornelis Claesz (?–1609), to pilot Lucas Waghenaeer (1534–1606) and diplomat Franciscus Maelson (1538–1601). It is to this transformation of nautical knowledge, and its adaptation to the goals of the Dutch release, that I now turn.

A brief word should first be given to the rutters published in the *Reys-gheschrift*.³⁹ Out of sixty-seven rutters, sixty-three came from Portuguese sources, while only four are of Spanish origin. All these rutters seem to have been collected by Jan Huygen during his Iberian career, albeit during different phases. The rutters on the Portuguese India Run, linking Lisbon to Goa, would have been acquired at the viceroy's palace in Goa, where such

38 McKew Parr, *Jan van Linschoten*, 199–204; Arie Pos, “Sources and Organisation of the Botanical Section of the *Itinerario* (1596) by Jan Huygen van Linschoten,” *Review of Culture: International Edition* 20 (2006): 49 and 54; Van den Boogaart, *Jan Huygen*, 19; Ernst van den Boogaart, *Civil and Corrupt Asia: Word and Text in the Itinerario and the Icones of Jan Huygen van Linschoten* (Chicago: University of Chicago Press, 2003), 5; Saldanha, “The Itineraries of Geography,” 157; *Itinerario*, 17–18; Delmas, “L'*Itinerario* de J. H. van Linschoten,” 7–9; Benjamim Schmidt, *Innocence Abroad: The Dutch Imagination and the New World, 1570–1670* (New York: Cambridge University Press, 2001), 161–162.

39 For more details see: Nuno Vila-Santa, “Jan Huygen van Linschoten and the *Reys-gheschrift*: Updating Iberian Science for the Dutch Expansion,” *Historical Research* 95, no. 265 (2021): 736–757.

texts were typically copied and issued, together with nautical instruments, to captains and pilots before maritime voyages. This subset of rutters bears a notable resemblance to the main Portuguese seamanship compilations of the time, particularly that of Manuel Álvares.⁴⁰ The viceroy's palace may also have been where Jan Huygen copied some of the rutters for navigation to Melaka and Java Island. Other rutters, however (and in particular, those concerning navigation to China and Japan, comprising almost half of the rutters that Van Linschoten published), were handed over directly by Dirck Gerritsz Pomp (1544–ca. 1608),⁴¹ the first Dutchman known to have sailed to China and Japan. Profiting from knowledge gained in his service to Portugal as constable of artillery during three maritime voyages,⁴² Pomp would have been an ideal informant. He was, moreover, instrumental in helping his friend embark from Goa for Europe in 1589, as Jan Huygen records in the *Itinerario*.⁴³

As he explicitly states in the *Itinerario*, it was at the viceroy's palace that Van Linschoten copied the "secret" rutters written by Spanish navigator Francisco Gali (1539–1586).⁴⁴ Gali's rutters detailed three main routes: the Manila galleon route; a way from Manila to Macau which, by that time, was forbidden by the Portuguese authorities; and the first nautical route between Macau and Acapulco (effected by sailing to latitudes north of the Japanese archipelago in the direction of the North American continent, and then continuing until reaching the Mexican coast). Pomp, referenced above, was not the only useful contact Van Linschoten acquired—in his 1589 voyage to Europe, he would have met pilot Gaspar Reimão Ferreira (?–1626),⁴⁵ and possibly pilot Vicente Rodrigues, as well as captains Paulo de Lima Pereira (?–1587) and Matias de Albuquerque (1547–1609).⁴⁶ Through

40 *O livro de marinharia de Manuel Álvares*, ed. Luís de Albuquerque and Armando Cortesão. (Lisboa: Junta de Investigações do Ultramar, 1969).

41 Arie Pos, "Dirck Gerritsz Pomp e Jan Huygen van Linschoten. Amigos-aventureiros na Índia portuguesa e pioneiros da expansão marítima holandesa," *Revista Portuguesa de História do Livro* III, 5 (1999): 68–72.

42 *Itinerario*, 306–308.

43 For more details on Pomp see: J. W. IJzerman, *Dirck Gerritsz Pomp, alias Dirck Gerritsz China, de eerste Nederlander die China en Japan bezocht (1544–1604)* ('s-Gravenhage: Martinus Nijhoff, 1915) and Pos, "Dirck Gerritsz Pomp e Jan Huygen van Linschoten."

44 About Gali see: Rui Manuel Loureiro, "Inquérito sobre um navegador enigmático. Francisco Gali e as suas viagens transpácificas," *Revista de História da Cultura* 60 (2019): 90–103.

45 Kioko Koiso, *Mar, medo e morte: aspectos psicológicos dos naufrágios na História Trágico-Marítima, nos testemunhos inéditos e noutras fontes* (Cascais: Patrimonia, 2004), 1:101.

46 As argued in note 12. For Lima Pereira, Van Linschoten recorded his shipwreck in the *Itinerario*. As for Albuquerque, Van Linschoten met him at Goa while he was no longer a viceroy

such informants, or perhaps via his Flemish friend Gerrit van Afhuysen, (who had been an overseer in Melaka, and whom Jan Huygen met at Saint Helena Island in 1589),⁴⁷ Van Linschoten learned of a direct nautical route between Lisbon and Melaka, practiced by sailing eastwards of Madagascar Island to Java Island. This Portuguese route had been sailed by captain Matias de Albuquerque in 1576 at the orders of King Sebastião —soon, the Dutch would make it their own.⁴⁸ This was the very route that Cornelis de Houtman inaugurated on his 1595 voyage to Asia, and which would be adopted by most of the subsequent Dutch fleets, bringing an end to its original Portuguese monopolization.⁴⁹

Through his two-year stay in Angra and with Urbina's trust, Van Linschoten became acquainted with Portuguese and Spanish rutters on Atlantic navigation, acquiring rutters of the Brazilian coast, as well as the main Spanish rutters providing a route to the West Indies. For the former, it is likely that Jan Huygen relied on the Brazilian atlas-rutter of Portuguese cartographer Luís Teixeira.⁵⁰ Whether the Dutchman was granted access by Luís Teixeira himself, or with Urbina's authorization, remains in doubt. Some authors have argued that he might have also perused a 1580s work on Brazil by Gabriel Soares de Sousa while in Angra.⁵¹ Although it is a possibility, textual comparison of Sousa's and Van Linschoten's texts makes this unlikely. As for the Spanish rutters, the Dutchman likely consulted manuscript versions circulating between Spanish seamen.⁵²

Jan Huygen was likewise given certain materials once he returned to the Dutch Republic. For example, he copied and updated the rutter for navigation to Angola from a book by Fillippo Pigafetta (1533–1604), who had interviewed

and even commented on his appointment, by Philip II, as viceroy of India in 1591 (*Itinerario*, 162, 316–320 and 352).

47 *Itinerario*, 325.

48 “Vida e acções de Mathias de Albuquerque cappitão e Viso-Rey do Estado da Índia. Primeira e segunda parte em que se contam todas as suas acções, e as dos insígnes feitos que se obraram na memorável tomada do Morro de Chaul. Tresladado no anno de 1749,” *Mare Liberum* 15 (1998): 171–172.

49 Arie Pos, “A Stranger's Testimony: Some of Jan Huygen van Linschoten's Views on and from Goa Compared with Portuguese Sources,” *Itinerario* 28, no. 2 (July 2004): 129.

50 *Roteiro de todos os sinais, conhecimentos, fundos, baixos, alturas, e derrotas que há na costa do Brasil desde o cabo de Santo Agostinho até ao estreito de Fernão de Magalhães*, ed. Melba Ferreira da Costa (Lisboa: Tagol, 1988).

51 Gabriel Soares de Sousa, *Notícia do Brasil*, ed. Francisco Adolfo de Varnhagen, Manoel Pirajá da Silva, and Frederico G. Edelweiss (São Paulo: Emp. Gráfica de Revisão dos Tribunais, 1974). See Fabiano Bracht's study on this author and book in chapter 5.

52 For more details see: Vila-Santa, “Jan Huygen van Linschoten and the *Reys-gheschrift*.”

Duarte Lopes, a Portuguese ambassador to Congo.⁵³ With the aid of friends who were in close diplomatic and scientific contact with the English, like Franciscus Maelson, cartographer Jodocus Hondius (1563–1612), and Dutch merchants and seamen, Van Linschoten might have acquired Portuguese pilot Nuno da Silva's celebrated rutter. Silva was the Portuguese pilot whom Francis Drake (ca. 1540–1596) had employed in his circumnavigation of the world, drawing on his expertise for the crossing of the South Atlantic and entering of the Pacific Ocean. Silva's work—one of the best nautical rutters on the crossing of the Strait of Magellan⁵⁴—would be published by Van Linschoten in the *Reys-gheschrift*.

Finally, the more strictly scientific final sections of the *Reys-gheschrift* (like the latitude listing of ports worldwide, a regiment on the use of the nautical compass, and a set of quick questions and answers for sailors) were possibly worked up and provided by Petrus Plancius. It is possible that part of the information therein came from the Houtman brothers' spy mission discussed above. This inference is based upon the fact that Plancius worked with just the sort of Iberian cartographic materials (such as maps from Portuguese cartographer Bartolomeu de Lasso, purchased by the Houtmans in 1592 in Lisbon, and the maps by Portuguese cartographer Luís Teixeira that were published at the Low Countries) that appear in the *Itinerario*.⁵⁵ At stake was the training of seamen in oceanic navigation to Asia, a first for the Dutch. Indeed, Plancius's role as a scientific "mentor" for the 1595 voyage of Cornelis de Houtman (and later Dutch expeditions) is well documented. Interestingly, there are indications that Plancius at times adopted a policy of nautical secrecy, showing his concern with English competition.⁵⁶

In the reshaping of the *Reys-gheschrift*, Van Linschoten often altered the content of Iberian rutters, substituting their information with his own

53 Duarte Lopes and Filippo Pigafetta, *Relação do Reino do Congo e das terras circunvizinhas*, ed. Ilídio do Amaral (Benavente, Câmara Municipal de Benavente, 2000), 49–54 and 57–62.

54 For a broader overview of European crossings of the Magellan Strait and the evolution of nautical rutters on this route see Henrique Leitão and José María Moreno Madrid, *Atravessando a porta do Pacífico. Roteiros e relatos da travessia do Estreito de Magalhães* (Lisboa, By the Book, 2020). On Nuno da Silva see also: José María Moreno Madrid and David Salomoni, "Nuno da Silva's Third Relation: An Unknown Report on Francis Drake's Voyage (1577–1580)." *Terrae Incognitae* 54 (2022): 64–82.

55 Günter Schilder, *Monumenta Cartographica Neerlandica* (Alphen aan den Rijn: Canaletto, 2003), 108–113 and 204; McKew Parr, *Jan van Linschoten*, 204.

56 Djoeke van Netten, "Sailing and Secrecy: Information Control and Power in Dutch Overseas Companies in the Late Sixteenth and Early Seventeenth centuries," in *Information and Power in History: Towards a Global Approach*, ed. Ida Nijenhuis, Marijke van Faassen, Ronald Sluiter, Joris Gijzenbergh, and Wim de Jong (London: Routledge, 2020).

data. Studies have identified changes to latitude degrees, stopping places, currents, tides, and several coastal descriptions.⁵⁷ In most cases, though, it is uncertain whether the changes were introduced by Jan Huygen himself or by those collaborating with him on the *Reys-gheschrift*, like Petrus Plancius, Cornelis Claesz, Bernardus Paludanus, and Lucas Waghenaer. Like the other sections of the *Itinerario*, the *Reys-gheschrift* was a work of many hands, and thus typical of the Dutch Golden Age cultural and scientific ambience.⁵⁸

Analysis of the *Reys-gheschrift* offers glimpses of Van Linschoten's rising scientific status within the Dutch Republic. After learning at sea with the Portuguese and the Spanish during his Iberian career, he continued to improve his knowledge after resettling in Enkhuizen. This upward trajectory is directly related to Jan Huygen's participation in Dutch-sponsored northern navigation (in search of a nautical route to China) in 1594 and 1595, which easily testifies to the critical nautical and scientific role that he played in those expeditions. For this reason, his scientific disputes and clashes with Petrus Plancius deserve to be better studied, as Van Linschoten became a fervent opponent of Plancius's obsession with sailing to China via the Arctic, and advocated for coastal navigation through Northern Russia.⁵⁹ This tension is easily felt in his own 1601 report on the 1594 and 1595 expeditions.⁶⁰ Jan Huygen did not join Cornelis de Houtman on the 1595 voyage to Asia. He did offer advice, though, suggesting a route to Java Island⁶¹ between Madagascar Island and Melaka that he had learned from the Portuguese. Van Linschoten invested in the VOC (the Dutch East India Company, created in 1602) in 1606,⁶² and was consulted on the future foundation of the WIC (the Dutch West India Company). While continuing to play a major role in Dutch nautical science—a role which merits much deeper study and further scholarly attention—Jan Huygen never returned to Asia.

57 Further details in: Vila-Santa, "Jan Huygen van Linschoten and the *Reys-gheschrift*," 7.

58 Klaas van Berkel, "The Dutch Republic: Laboratory of the Scientific Revolution," *BMGN – Low Countries Historical Review* 125, no. 2–3 (2010): 81–105; Harold J. Cook, *Matters of Exchange: Commerce, Medicine and Science in the Dutch Golden Age* (London: Yale University Press, 2007); Karel Davids, "Dutch and Spanish Global Networks of Knowledge in the Early Modern Period: Structure, Changes and Limitations," in *Centres and Cycles of Accumulation in and around the Netherlands during the Early Modern Period*, ed. Lissa Roberts (Muenster: LIT Verlag, 2011).

59 Saldanha, "The Itineraries of Geography," 159.

60 *Reizen van Jan Huyghen van Linschoten naar het Noorden, 1594–1595*, ed. S. P. L'Honore Naber ('s-Gravenhage: Martinus Nijhoff, 1914).

61 *Itinerario*, 19.

62 Van den Boogaart, *Jan Huygen*, 20.

Conclusion

Far from being a spy, Van Linschoten was above all what Kapil Raj and other scholars have called a “go-between” or a “cross-cultural broker.”⁶³ It was precisely in this capacity that the Dutchman was able to move throughout the Iberian world gathering “secret knowledge,” as nautical rutters were understood to contain. Had Jan Huygen operated as a spy, as has been argued, one would expect some reference to this activity among this several contacts in the Dutch intelligentsia from the 1590s. Such evidence is notably absent. Furthermore, Jan Huygen’s personality, professional trajectory, and statements in the *Itinerario* are at odds with the features typical of espionage in the sixteenth century. A careful analysis of the Dutchman’s Iberian career shows that he was only able to acquire and travel with sensitive information because the work ultimately known as the *Itinerario* was initially intended to be an Iberian publication. The fact that it ended up printed in the Dutch Republic after an intensive adaptation that Van Linschoten fully accepted only supports his characterization as a cross-cultural broker.

The methods by which he acquired nautical data and the process of their adaptation throw added light on the complexities of both information circulation, and its transformation into knowledge, in this period. The usual narrative surrounding Jan Huygen (i.e., a Dutch spy who left his homeland in 1579 to plunder Iberian nautical knowledge) is too simplistic. As has been shown, Van Linschoten’s departure was not motivated by a classic espionage assignment, like the ones often given to ambassadors, agents, and spies. It was only thanks to exceptional circumstances, like his winning of Fonseca’s trust, that Jan Huygen obtained the status necessary for accessing Portugal’s “secret” nautical knowledge. Similarly, the success of the Dutchman’s process for gathering information was far from guaranteed—his overall history either in his Iberian or in his Dutch periods could easily have been influenced by events unfolding around him. This much is clear in his reasoning for leaving Goa in 1588 or his 1592 stay in Lisbon. After all, had the archbishop’s death not taken place so early, would Van Linschoten have returned to Europe so soon—or instead, remained in Fonseca’s service, received a promotion, and settled permanently in Asia? Although it is impossible to

63 Kapil Raj, “Go-Betweens, Travelers, and Cultural Translators,” in *A Companion to the History of Science*, ed. Bernard Lightman (Chichester: John Wiley & Sons, 2020); see also Alida Metcalf, *Go-Betweens and the Colonization of Brazil, 1500–1600* (Austin, TX: University of Texas Press, 2005) and Simon Schaffer et al., eds., *The Brokered World: Go-Betweens and Global Intelligence* (Sagamore Beach: Science History Publications, 2009).

provide a final answer, the question merits posing. It underscores the fact that from the moment the Dutchman left Enkhuizen in 1579, the process of information gathering had been far from linear.

Still, even after securing “Iberian” knowledge, Van Linschoten hesitated on how to use it. With a goal of elevating his station through publication, he had options—these ends could be achieved either in the service of Iberian patrons, or within the Dutch Republic. With this in mind, Jan Huygen’s career vacillations make sense. His decision to ultimately publish in the Dutch Republic would have been informed by his sojourn in Angra and Lisbon, a time when Van Linschoten could get hold of invaluable updates on the war in the Low Countries. Thus, the *Itinerario*’s publication in 1596 is best seen as the fruit of its author’s continual adaptation to shifting circumstances—and not, as has been stressed, the outcome of a planned spy mission. Still, if the commercial information of the *Itinerario* was important in paving the way for Northern European maritime expansion, particularly to Asia,⁶⁴ the crucial part of this book was its publication of the main Iberian nautical rutters. Indeed, in scale and dissemination, the *Itinerario* was a historical feat.

With the *Itinerario*, the Dutch, the English, and the French were finally given a key to breach Iberian claims to *mare clausum*, a feat the rival powers had attempted unsuccessfully from the beginning of the sixteenth century. Since the *Itinerario* explained the chief sailing routes for the Earth’s three main oceans, it was a matter of time before the Dutch, English, and French would take up more permanent presences in all these areas. This was precisely what happened during the seventeenth century, when these three powers not only began creating long-lasting bases in the Atlantic, Indian, and Pacific Oceans but also managed to overthrow the Iberian maritime hegemony of the sixteenth century.

In terms of the impact of the Van Linschoten’s works, much remains to be studied. For instance, following Secord’s methodology,⁶⁵ it could prove fruitful to compare the many seventeenth-century re-editions of the *Itinerario* and the *Reys-gheschrift* in order to better comprehend the ongoing nautical/scientific developments at play during key moments of the Dutch, English, and French overseas expansions. Nevertheless,

64 On this topic see: Nuno Vila-Santa, “Jan Huygen van Linschoten’s *Itinerario*: A Decaying Commercial Portrait of Portuguese Asia?” in *Espelhos de Mercúrio. A representação do comércio nas Monarquias Ibéricas, 1500–1800*, ed. Pablo Sánchez León, Carla Vieira, and Nina Vieira (Coimbra, Imprensa da Universidade, 2024), 261–288.

65 Secord, “Knowledge in Transit.”

this chapter has aimed to make clear the importance that nautical rutters exerted not only in European science, but for the preparation of successful maritime expeditions—expeditions that ultimately birthed new maritime and overseas hegemonies and empires. Nautical rutters were truly part of what Ofer Gal has called “global knowledge,” generated by oceanic navigation, discoveries, and global trade. Such knowledge fostered breakthroughs in mathematics and science, and likewise laid the foundation for some of the early modern period’s most important “global institutions,” such as the trading companies or the Jesuits.⁶⁶ A related argument has recently been put forth by Ivonne del Valle, Anna More, and Rachel Sarah O’Toole in a volume entitled *Iberian Empires and the Roots of Globalization*, in which the editors suggested that globalization was provoked by long-distance voyages, worldwide imperial rule, and trade. The authors also stressed the connection of this globalization with the maritime expansion begun by Iberians and later followed by other European players.⁶⁷

Therefore, nautical rutters are not merely the purview of historians of science, but merit consideration from global and imperial historians. The amount of critical information they include is a lively testimony to the building of the global conception of the Earth as we know it today.⁶⁸ This consciousness emerged in the sixteenth century with the world’s first globalization,⁶⁹ triggered by navigation based on nautical rutters. As Van Linschoten’s case unmistakably demonstrates, nautical knowledge was a matter of interest to any power interested in launching long-distance maritime connections, irrespective of their motivations, whether commercial, political, religious, economic, or cultural.

66 Ofer Gal, *The Origins of Modern Science: From Antiquity to the Scientific Revolution* (Cambridge: Cambridge University Press, 2021), 159–172.

67 Ivonne del Valle, Anna More and Rachel Sarah O’Toole, “Introduction: Iberian Empires and a Theory of Early Modern Globalization,” in *Iberian Empires and the Roots of Globalization*, ed. Ivonne del Valle, Anna More and Rachel Sarah O’Toole (Nashville: Vanderbilt University Press, 2019), 3–5.

68 Denis Cosgrove, *Apollo’s Eye: A Cartographic Genealogy of the Earth in the Western Imagination* (Baltimore: Johns Hopkins University Press, 2001).

69 For the theory on the origins of sixteenth-century globalization see: Dennis O. Flynn and Arturo Giráldez, “Born Again: Globalization’s Sixteenth Century Origins,” *Pacific Economic Review* 13, no. 3 (2008): 359–387; Serge Gruzinski, *L’Aigle et le dragon: démesure européenne et mondialisation au XVI^e siècle* (Paris: Fayard, 2012). For more recent reassessments to the topic see: Pim de Zwart, and Jan Luiten van Zanden, *The Origins of Globalization: World Trade in the Making of the Global Economy, 1500–1800* (Cambridge: Cambridge University Press, 2018).

When looking at the circulation of nautical information, even between declared maritime rivals (in this area, R. C. D. Baldwin's work is relevant),⁷⁰ one is amazed at the velocity and intensity with which critical and often "secret" information circulated (a salient aspect of Van Linschoten's case). It is hardly surprising, then, that the pitch of scientific and technical espionage missions increased all along the sixteenth century (and reached a climax in the seventeenth century, when the connection between science and empire came into greater focus). There should be no illusions, however: while the acquisition of such knowledge is recognized by historians of science and historians in general, these processes still need to be fully contextualized in order to understand their relation to discourses on the connection between sixteenth-century Renaissance humanism and the so-called "scientific modernity" of the seventeenth century. The call for such approaches has long been made by Pamela Smith and Benjamin Schmidt, who have underscored the importance of more and deeper studies of the links between the eighteenth-century Enlightenment and its seventeenth-century scientific antecedents.⁷¹ But this narrative has a deeper history: most of the processes in question had already begun in the sixteenth century, as has been shown in this chapter. Studying Van Linschoten, a man who lived in this transitional period, provides an opportunity to readdress these major issues, and to document the complex but vital role that nautical rutters played in the early modern period.

Acknowledgements

This chapter was written in the context of the RUTTER project, which received funding from the European Research Council (ERC) under the European Union's Horizon 2020 Research and Innovation Programme (grant agreement no. 833438). I am also grateful to Professors Henrique Leitão, Rui Manuel Loureiro, Djoeko van Netten, and Florike Egmond for their comments and bibliographical assistance. I would like also to acknowledge my colleague José María Moreno Madrid for his aid in the identification of the Spanish rutters and to Šima Krtalic for her English-language editing assistance.

70 R. C. D. Baldwin, "The Development and Interchange of Navigational Information and Technology between the Maritime Communities of Iberia, North-Western Europe and Asia, 1500–1620," 2 vols (Master's thesis, Durham: Durham University, 1980).

71 Pamela H. Smith and Benjamin Schmidt, eds., *Making Knowledge in Early Modern Europe: Practices, Objects, and Texts, 1400–1800* (Chicago: University of Chicago Press, 2007), 16.

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5. The New Pathways of Knowledge: Early Modern Iberian Oceanic Rutters and the Emergence of a Global Knowledge Society

Fabiano Bracht

Abstract: This chapter examines the rise of Iberian empires as a global knowledge society during the early modern period, focusing on the production and circulation of nautical rutters. Despite having lower urbanization and less intellectual freedom than other European regions, Portugal and Spain fostered multicultural empires through extensive knowledge networks. The chapter analyzes how knowledge, particularly in navigation and cartography, drove expansion. Nautical rutters, as both technical documents and literary works, shaped maritime knowledge dissemination. Key works like Pero Magalhães de Gândavo's *Tratado da Terra do Brasil* (1569) and André Donelha's *Descrição dos Rios da Serra Leoa* (1625) illustrate how rutters served as epistemic scaffolds, integrating diverse knowledge fields and linking local insights to global strategies.

Keywords: early modern knowledge societies, non-specialized knowledge agents, Iberian knowledge economies, Atlantic rutters, trans-imperial information exchange, epistemic circulation

Introduction

From the late fifteenth century onwards, the Iberian nations conquered vast territories from the Atlantic to the Pacific. They consolidated their dominance through trade, naval power, missionary activity, and bureaucracy. In many ways, these two great empires shared social and economic features,

entanglements that were reinforced by their dynastic union between 1580 and 1640 under the House of Habsburg. By expanding their commercial networks, both experienced considerable economic growth through trade and the production of diverse tradable commodities. From Guinean gold to Asian spices, from Peruvian silver to brazilwood—to say nothing of sugar production and the slave trade—the Iberian empires benefited from a panoply of economic cycles without ultimately depending on them. However, there was one commodity which these two complex imperial systems relied upon entirely: knowledge.

Recent studies have pointed out the possibility of the emergence of early modern “knowledge societies” as being linked to a combination of specific socio-economic conditions. Such conditions provided the “activation energy” necessary for the flourishing of an economy based on the production and circulation of knowledge. In the Low Countries, for example, between the sixteenth and the late eighteenth centuries, reasonably high degrees of urbanization and population density, literacy rates, and monetization of commercial activities, combined with a certain degree of religious freedom and tolerance for the circulation of ideas, permitted the development of a dynamic market for knowledge and its artifacts.¹

This chapter argues that, from the late fifteenth century onwards, the Iberian empires emerged as a joint, and increasingly global, knowledge society. However, compared to other areas of Europe, such as the Low Countries, the Rhine valley, or Northern Italy, the Iberian nations were considerably less urbanized. Their scope of intellectual and economic freedom was also significantly lower, especially when measured against the Low Countries, England, certain areas in the north of the Italian Peninsula, and the German-speaking countries.² Even under these conditions, Portugal and Spain established multicultural empires entirely dependent on networks of production, accumulation, and transmission of knowledge at a global level. Rather than creating separate national or regional niches of knowledge production, the sixteenth-century expansionist process promoted the

1 Bert De Munck and Antonella Romano, “Knowledge and the Early Modern City: An Introduction,” in *Knowledge and the Early Modern City: A History of Entanglements*, ed. Bert De Munck and Antonella Romano (Abingdon: Routledge, 2019), 1–30; Inger Leemans and Anne Goldgar, *Early Modern Knowledge Societies as Affective Economies* (Abingdon: Routledge, 2020); Dániel Margócsy, *Commercial Visions: Science, Trade, and Visual Culture in the Dutch Golden Age* (Chicago: University of Chicago Press, 2014).

2 Daron Acemoglu, Simon Johnson, and James Robinson, “The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth,” *American Economic Review* 95, no. 3 (2005): 546–579.

circulation of people and knowledge on a scale never seen before, connecting (via the Iberian Peninsula) the Mediterranean to West Africa, India to Brabant, and the Alps to America.

The transformation of the Iberian empires into knowledge societies can be traced in studies on the development of diverse fields of scientific knowledge from at least the mid-fifteenth century.³ Progress in many such areas required combining elements of both practical and theoretical knowledge. Together, these fields contributed decisively to making knowledge the driving force behind the expansionist process.

Because the Iberian imperial project hinged upon navigation between far-flung sites, it required knowledge that could bring together advances in mathematics, astronomy, shipbuilding, and the production of nautical instruments. This could, and did, serve as scaffolding for the construction and expansion of knowledge in other fields (such as natural philosophy and cartography). In this context, the production of nautical rutters, and their consolidation as a literary genre, can be used as an archetypal case.

In the pages to follow, I will attempt to show that the development of oceanic rutters during the sixteenth and seventeenth centuries was crucial for the birth of the Iberian knowledge society. First, I will define “knowledge societies” and establish the parameters for applying the concept to the analysis of early modern societies. I then provide a contextualization of the evolution of nautical rutters, both as a specific field of knowledge production and as a distinct literary genre. Finally, I apply these concepts to the analysis of mid-sixteenth and early seventeenth-century rutters: Pero Magalhães de Gândavo’s *Tratado da Terra do Brasil* (1569), André Donelha’s *Descrição dos Rios da Serra Leoa* (1625), and Gabriel Soares de Sousa’s *Roteiro Geral* (1587).⁴

3 Jorge Cañizares-Esguerra, “Iberian Science in the Renaissance: Ignored How Much Longer?” *Perspectives on Science* 12, no. 1 (2004): 86–124; Henrique Leitão, “All Aboard! Science and Ship Culture in Sixteenth-Century Oceanic Voyages,” *Early Science and Medicine* 21, no. 2–3 (2016): 113–132; Antonio Sánchez and Henrique Leitão, “La ciencia ibérica: ¿Aparte o parte de la ciencia moderna?” *Revista de Occidente* 433 (2017): 5–18.

4 Pero de Magalhães Gândavo, *Tratado da Terra do Brasil: História da Província Santa Cruz, a que vulgarmente chamamos Brasil* (Brasília: Senado Federal, Conselho Editorial, 2008); André Donelha, *Descrição da Serra Leoa e dos Rios de Guiné do Cabo Verde* (1625): *An Account of Sierra Leone and the Rivers of Guinea of Cape Verde* (1625) (Lisboa: Junta de Investigações Científicas do Ultramar, 1977); Gabriel Soares de Sousa, *Tratado Descritivo do Brasil em 1587* (São Paulo: Companhia Editora Nacional, Série Brasileira, 1971).

5.1. Early Modern Knowledge Societies and the Circulation of Knowledge

The expression “knowledge society” describes a group engaging in a collective and organized effort to gather, process, and disseminate information and knowledge on a large scale.⁵ The term was first employed by economists and sociologists of the post-Second World War generation, such as Fritz Machlup⁶ and Peter Drucker,⁷ in an attempt to estimate the contribution of knowledge work to the economy. They developed theories on how the social sciences could deal with the social changes caused by the rise of information technologies and their impact on knowledge work. Some years later, with the studies of Daniel Bell,⁸ a more comprehensive understanding of such matters was elaborated, dealing with the nature of post-industrial societies and the role of theoretical knowledge as their new “axial principle” (that is, as the impetus for economic growth).

Since these early efforts, research on the concept of “knowledge society” has increasingly focused on two dimensions: the consequences of technological innovation⁹ and the function of institutions in the regulation of knowledge production processes.¹⁰ Following this path, sociological and historical inquiry has concentrated on the extent to which technological developments influence structural changes in organizational and cultural institutions.¹¹ When applied to the study of contemporary societies, the notion of “knowledge society” relates to the widespread influence of data networks (often computer-based) on the processes of gathering, reproduction, storage, circulation, and management of information about diverse aspects of collective and individual life. Knowledge societies also tend to establish, either through direct state intervention or through self-organized processes, systems for the production, accumulation, and sharing of knowledge through educational institutions, informal societies, or corporations of experts. The concept of “knowledge

5 Wolfgang Krohn, “Knowledge Societies,” in *International Encyclopedia of Social and Behavioral Sciences* (Amsterdam: Elsevier, 2001), 12:8139–8143.

6 Fritz Machlup, *The Production and Distribution of Knowledge in the United States* (Princeton: Princeton University Press, 1962).

7 Peter Drucker, *The Age of Discontinuity: Guidelines to Our Changing Society* (London: Routledge, 2017).

8 Daniel Bell, *Post-Industrial Society* (London: Routledge, 2020).

9 Nico Stehr, “Modern Societies as Knowledge Societies,” in *Handbook of Social Theory*, ed. George Ritzer and Barry Smart (London: Sage Publications, 2003), 494–508.

10 Jürgen Renn, “From the History of Science to the History of Knowledge – and Back,” *Centaurus* 57, no. 1 (2015): 37–53.

11 Krohn, “Knowledge Societies,” 8139–8143.

society” thus asks how researchers, experts, and analysts deal with both the challenge of making sense of information, and the knowledge-based strategies used by individuals and institutions for decision-making.

In this sense, while knowledge, not production or trade, becomes the catalyst of economic development, individuals belonging to professional groups and corporations tend to share information and knowledge specific to their professions with other social and professional groups and corporations, increasing the number of agents able to produce knowledge and promote its circulation.¹²

Over the last decades of the twentieth century, academic and public attention extended the general concept of a social centrality of knowledge to a wide range of fields of inquiry. Attention was paid to the transformations of the class structure in knowledge societies, its relationship with globalization, the diffusion of specialized culture, and the relevance of intellectual capital together with its impact on economic fluctuations.¹³ The term “knowledge society” has come to be used comprehensively, insofar as it pertains to the idea of broad-spectrum social changes. However, given the uneven distribution of the conditions under which knowledge societies can develop, Nico Stehr’s proposal for an analytical division comprising different patterns of knowledge societies has been broadly accepted. This division implies that knowledge societies do not emerge as contingent and necessary developments from a common evolutionary pattern and, therefore, cannot be understood as monolithic social arrangements. Rather, they become comparable by maintaining or acquiring distinctiveness. It is precisely this feature that has enabled the concept “knowledge society” to resonate beyond the scope for which it was initially designed.¹⁴ Scholars of both the history of science tradition and the emerging field of the history of knowledge have recently sought to historicize the notion of the knowledge society,¹⁵ starting from the assumption that every age is, in a certain respect, an age of knowledge.¹⁶ As diverse as they are, past and present knowledge societies

12 Roberto M. Unger, *Knowledge Economy* (London: Verso Books, 2019).

13 Krohn, “Knowledge Societies,” 8139–8143; Unger, *Knowledge Economy*.

14 Stehr, “Modern Societies as Knowledge Societies,” 494–508.

15 Peter Burke, *What Is the History of Knowledge?* (Cambridge: Polity Press, 2016); Lucas M. Verburgt, “The History of Knowledge and the Future History of Ignorance,” *KNOW: A Journal on the Formation of Knowledge* 4, no. 1 (2020): 1–24; De Munck and Romano, “Knowledge and the Early Modern City”; Leemans and Goldgar, *Early Modern Knowledge Societies*.

16 Stehr, “Modern Societies as Knowledge Societies”; Kajsa Brillman, “The Circulation of Knowledge in Translations and Compilations,” in *Circulation of Knowledge: Explorations in the History of Knowledge*, ed. Johan Östling et al. (Lund: Nordic Academic Press, 2018).

share at least one common characteristic: their economic development depends largely on producing, accumulating, and circulating knowledge across social strata. However, as virtually all human societies produce knowledge and develop myriad mechanisms for its accumulation, special attention should be given to the circulation processes themselves, and how institutions and networks, be they formal or self-organized, are implicated.

In historical terms, knowledge production and circulation are linked to the establishment of communicational processes¹⁷ often involving coercion and social, economic, or racial inequality.¹⁸ With this in mind, thinking in terms of circulation principles is currently gaining ground among the upcoming generation of historians.¹⁹ In early modern Europe, knowledge production, circulation, and consumption rapidly expanded, decisively contributing to fundamental changes in the existing social and economic organization. Through the invention of the printing press, the growth of power centralization and state control mechanisms, the funding of new kinds of knowledge institutions, and the development of new trade networks and companies, early modern Atlantic trader²⁰ societies, through a global and interactive process, evolved to be highly dependent on rapid movement of information and knowledge.²¹

By that time, knowledge could circulate swiftly between distant parts of the globe, particularly those connected through the networks and institutions set up by the Iberian empires. In the early seventeenth century, for example, medical and pharmaceutical knowledge produced in, say, Portuguese India or at the Jesuit missions in Indochina could reach the dignitaries of Philip II's court in Madrid in less than a year, or even missionaries in Peru, colonial authorities in Mexico, or settlers in Brazil.²² The

17 James A. Secord, "Knowledge in Transit," *Isis* 95, no. 4 (2004): 654–672.

18 Marie Louise Pratt, *Imperial Eyes: Travel Writing and Transculturation* (Abingdon: Routledge, 1992); Richard White, *The Middle Ground: Indians, Empires, and Republics in the Great Lakes Region, 1650–1815* (Cambridge: Cambridge University Press, 2001).

19 For a comprehensive overview of how historians of science and knowledge have explored the concept of circulation of knowledge, see: Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900* (Basingstoke: Palgrave Macmillan, 2010); Helge Wendt, *The Globalization of Knowledge in the Iberian Colonial World* (Berlin: Max Planck Institute for the History of Science, 2017); Johan Östling et al., *Circulation of Knowledge: Explorations in the History of Knowledge* (Lund: Nordic Academic Press, 2018).

20 Acemoglu, Johnson, and Robinson, "The Rise of Europe," 546–579.

21 As discussed in Östling et al., *Circulation of Knowledge*; De Munck and Romano, "Knowledge and the Early Modern City," and Margócsy, *Commercial Visions*.

22 Fabiano Bracht, *Ao ritmo das monções: Medicina, farmácia, história natural e produção de conhecimento na Índia portuguesa no século XVIII* (Porto: Edições Afrontamento, 2017).

multiple mechanisms of knowledge transfer that allowed such a circulation speed constituted a *sine qua non* for the emergence of a knowledge society. In this sense, the success of early modern Iberian empires was essentially the result of the expansion and acceleration of the processes of circulation of knowledge through individuals, artifacts (especially tradable goods), and ideas.²³ It is to be observed here that the historicization of transference and circulation processes is often tainted by the contemporary conception of border. Early modern boundaries were different both mentally and geographically,²⁴ and the circulation of knowledge was frequently dependent on personal connections that allowed people, products, and artifacts to cross them.²⁵

As a result of increased scholarly interest in the roots of contemporary knowledge societies,²⁶ recent research has addressed the role of specific historical conditions, such as the existence of urbanized hinterlands and the formation of a merchant class whose activities reached out globally. All this, combined with a high degree of intellectual (and religious) tolerance, literacy, mobility, and immigration, supported the formation of a market of knowledge consumers and, therefore, laid the groundwork for a knowledge economy.²⁷

Given the diversity of past knowledge societies, the prerequisites for their emergence are variable. In the case of the early modern Iberian worlds, the relative dispersion of urban networks, lower literacy rates, and curtailed intellectual and religious freedom necessarily point to different stimuli.²⁸ Compared with the Low Countries, the city-states of northern Italy, some regions of the Rhine valley, or even the territories ruled by the Hanseatic League, the Iberian Peninsula was more rural and, consequently, its knowledge consumer market was of a lower density. Additionally, as a direct result of the Counter-Reformation, institutional regulation of intellectual activity was tighter (an extreme example being Philip II's ban on his subjects studying abroad), not to mention the effects of the expulsion of the Jews and the constraints to which the "New Christians" were often

23 Bartolomé Yun Casalilla, *Os impérios ibéricos e a globalização da Europa (séculos XV a XVII)* (Lisboa: Temas e Debates, 2021).

24 Burke, *What Is the History of Knowledge?*; Bracht, *Ao ritmo das monções*.

25 Bracht, *Ao ritmo das monções*.

26 Sven Dupré and Geert Somsen, "The History of Knowledge and the Future of Knowledge Societies," *Berichte zur Wissenschaftsgeschichte* 42, no. 2–3 (2019): 186–199.

27 Leemans and Goldgar, *Early Modern Knowledge Societies*.

28 Stehr, "Modern Societies as Knowledge Societies," 494–508.

subjected.²⁹ Even so, one may hypothesize that through long-distance trade, the development of informal, self-organized networks, and the multiplicity of knowledge-producing cultural encounters and missionary activities, Iberian societies developed many of the conditions needed for large-scale and globally distributed information gathering and sharing. That is, they fulfilled key prerequisites for the cultivation of a knowledge society by other means.

It is now accepted that informal networks were a crucial player in the history of knowledge circulation in the early modern Iberian empires.³⁰ Such networks brought together a diverse set of agents including patrons, merchants, cartographers, apothecaries, physicians, and armchair savants, not to mention ship-owners, sailors, and pilots. Moreover, there is a growing historiographical tendency to study the Iberian empires as an articulated complex of knowledge production.³¹ Indeed, in addition to having been politically united for sixty years (between 1580 and 1640), these empires often shared knowledge through the intensive circulation of diverse practitioners, such as those listed above.³²

Due to their shared social, cultural, and economic characteristics, Portugal, Spain, and their colonial empires should not be treated in isolation. Since the *Reconquista*, narrow social, economic, and cultural connections developed between the Christian Peninsular kingdoms.³³ In this process, Iberian elites, nobility, clergy, and the mercantile and artisan communities developed bonds that enabled the interchange of monetary resources, tradable goods, people, and knowledge at the most varied levels. Even before the Iberian Union (1580–1640), in addition to the presence of Portuguese mercantile communities in cities such as Antwerp, Frankfurt, and London, the links between the interests of Castile, the Genoese financial elites, and the extensive commercial connections of the Aragonese with the Mediterranean world were long consolidated.³⁴ From the accession of the Habsburgs to the Spanish throne (1516), and the later union between Spain and Portugal (1580), the Iberian kingdoms became the nexus of a planetary political and economic system.³⁵ The early modern period found the Iberian

29 Casalilla, *Os impérios ibéricos*, 50–58.

30 Raj, *Relocating Modern Science*, 1

31 As discussed in Bracht, *Ao ritmo das monções* and Cañizares-Esguerra, “Iberian Science in the Renaissance.”

32 Sánchez and Leitão, “La ciencia ibérica”; Leitão, “All Aboard!”; Casalilla, *Os impérios ibéricos*.

33 As shown in Leitão, “All Aboard!”

34 Casalilla, *Os impérios ibéricos*, 59.

35 Ana Sofia Ribeiro, *Early Modern Trading Networks in Europe: Cooperation and the Case of Simon Ruiz* (Abingdon: Routledge, 2017).

kingdoms and their imperial complexes setting up worldwide information and knowledge networks that became fundamental to the economic growth of Europe, America, and even certain regions in Asia. Information and knowledge flows were crucial to decision-making throughout, leading to strategic choices at virtually every economic, political, and social level.

With this background in mind, at least two questions arise. Firstly, how does the variability of “knowledge” fit into the equation? And secondly, how could a body of knowledge transcend the specific niche of its development to permeate the activities of the groups who subsequently extended its use, thus integrating it into the circuits of a knowledge economy? The following section will address these questions. To do so, it will draw upon one of the most important corpora of knowledge for long-distance oceanic voyages and, consequently, for the expansion and consolidation of early modern colonial empires.

5.2. Nautical Rutters and the Emergence of a Global Knowledge Society

Alongside the development of ocean-going vessels, progress in astronomy, and the technological leap experienced in the manufacture of nautical instruments, early modern nautical rutters were the cornerstone of the long-distance voyages undertaken by Europeans from the second half of the fifteenth century onwards.³⁶ Artifacts that could easily be transmitted from hand to hand, nautical rutters (and ships’ logbooks) are technical documents that collected and analyzed critical information for the successful execution of oceanic navigation. In addition to the knowledge needed for long-distance navigation, such as distances, latitudes, currents, tides, and winds, these compendia also contained information about the natural world, geography, and peoples, and their cultural and political systems.

The advent of widely-disseminated written texts to guide navigation dates back to the late Middle Ages,³⁷ with two distinct traditions evolving in the Mediterranean and Northern Europe. In the Mediterranean, centuries of

36 Leitão, “All Aboard!” 125–127.

37 Richard W. Unger, “Ships and Sailing Routes in Maritime Trade around Europe 1300–1600,” in *The Routledge Handbook of Maritime Trade around Europe 1300–1600*, ed. Wim Blockmans, Mikhail Krom, and Justyna Wubs-Mrozewicz (Abingdon: Routledge, 2017), 17–35; José M. Malhão Pereira, “Roteiros portugueses, séculos XVI a XVIII: Sua gênese e influência no estudo da hidrografia, da meteorologia e do magnetismo terrestre” (PhD diss., University of Lisbon, 2018); Charles H. Cotter, “A Brief History of Sailing Directions,” *The Journal of Navigation* 36, no. 2 (1983): 249–261.

transmission (primarily oral) from Greek, Latin, and Arab practices merged into the genre of documents known as *portolani*. These sailing directions mostly indicated a route from one port to another, marking distances, landmarks, and warnings against dangers such as rocks and sandbanks. Although they were mainly developed as low-priced and easily acquired items shared among merchants and their pilots, the genre went beyond its original production niche during the fifteenth century, and some texts came to be printed and published in more generalist nautical books.³⁸ Addressing several developments in nautical technology, especially the magnetic compass, the *portolani* also built on progress made by Iberian cosmographers and pilots. Suitable for the predominantly coastal navigation needs of the Mediterranean, late fifteenth-century *portolani* did not provide information on latitudes or tides and their variations.³⁹

In Northern Europe, likewise building on centuries of oral transmission, several genres of written sailing directions coalesced. By the mid-fifteenth century, their most widespread form had its origins in the accumulated knowledge of seafarers who sailed the great cogs through the many routes between the Baltic and the Bay of Biscay via the North Sea and the English Channel. Unlike the *portolani*, written mainly in the Italian languages, these northern navigational instructions circulated in both Low German (*See-buchen*), the diverse languages of the Dutch/Flemish context (*leeskaarten*), French (*routiers*), and English (*rutters*).⁴⁰ In contrast to the *portolani*, they provided precise indications on tidal variations, which were extremely important for navigation among the many shallows and sandbanks existing between Normandy and the Baltic.⁴¹

The Iberian tradition (appearing in the fifteenth century and at first predominantly Portuguese) was based on the knowledge circulating in both of these worlds. The experience gradually acquired by Portuguese mariners exploring the African coast can be associated with advances in astronomy, mathematics, shipbuilding techniques, and the production of nautical instruments.⁴² These in turn influenced the development of a new type of rutter. Portuguese oceanic rutters incorporated increasingly precise latitude measurements, distances, and depths. During the fifteenth

38 Cotter, "A Brief History of Sailing Directions," 249–261.

39 Malhão Pereira, *Roteiros portugueses*.

40 Unger, "Ships and Sailing Routes in Maritime Trade around Europe 1300–1600," 17–35.

41 Yftinus T. Popta, Christer L. Westerdahl, and Brad G. Duncan, "Maritime Culture in the Netherlands: Accessing the Late Medieval Maritime Cultural Landscapes of the Northeastern Zuiderzee," *International Journal of Nautical Archaeology* 48, no. 1 (2019): 172–188.

42 Leitão, "All Aboard!" 113–132.

century, they began to include augmented information about streams, tides, natural elements, and the inhabitants of the explored lands. In the early sixteenth century, as Atlantic navigation proceeded, advice on covering long distances across the open ocean, associated navigational guidance, and comments related to trade likewise appeared in Portuguese rutters.⁴³

By 1500, this new genre of sailing directions, the *roteiro*, had attained some clearly defined parameters. Initially, the type of knowledge they produced probably only came from practitioners with special training, such as pilots, cartographers, and cosmographers. But the rapid development of imperial circuits triggered wide-ranging transformations in various social structures, including those related to navigational knowledge production, whether theoretical or practical. As a consequence, existing hierarchies of knowledge were restructured, and the social role of knowledge producers was profoundly changed. Just as pilots, shipbuilders, and artisans making nautical instruments became progressively more important, the ability to produce oceanic rutters, bringing together diverse bodies of knowledge, also grew essential. Throughout the sixteenth century, such agents (and the knowledge they produced) circulated across Europe, particularly within the domains of the Spanish crown. Over time, the model developed by the Portuguese was adopted and adapted by rival nations and, by the mid-sixteenth century, this standard structure for rutter-writing became the most widespread across Europe.⁴⁴ The diffusion, exchange, and remaking of knowledge fostered by navigation was from the outset significant in the Iberian Peninsula, and would become particularly intense after the union of the Iberian crowns in 1580.

5.3. Nautical Rutters and the Economic Circuits of a Composite Empire

The process through which a global circulation of individuals, resources, and goods materialized was crucial to the cultivation of early modern knowledge societies. The agents of this transformation often operated within the many informal networks that intersected (or overlapped) with contemporary administrative, military, educational, and religious institutions. Insofar as the Iberian Union affected these structures, it is now worth pausing to consider its impact in slightly greater detail.

43 Malhão Pereira, *Roteiros portugueses*, 50–105.

44 Malhão Pereira, *Roteiros portugueses*, 50–105.

Like that of other early modern political conglomerates, the establishment of the empire ruled by the Habsburgs from 1580 onwards followed the basic principles of what John H. Elliott has termed “composite monarchies.” From an institutional point of view, both Iberian crowns largely preserved their administrative organizations’ autonomy.⁴⁵ From a purely formal point of view, this implied, among other consequences, that the Portuguese could not participate directly in Castile’s trade with America, while the Spanish were not allowed to deal in spices and other Asian products. Although subjects of the same monarch, a Castilian immigrant in, say, Bahia, or a Portuguese immigrant in Buenos Aires were considered as foreign as if they had been of Austrian, Flemish, or Genoese origin. The same separation was maintained in the supervision of overseas affairs. The jurisdictions of the Consejo de las Indias (Spain) and the Casa da Índia (Portugal) remained entirely distinct. The same went for the ecclesiastical structures of the secular clergy, the Inquisition, and the distribution of military expenditures.⁴⁶

However, understanding the entanglement of the Iberian empires and the genesis of their shared knowledge society requires considering, first and foremost, the activities of social networks and informal institutions. In practical terms, it was not always possible for regulatory institutions to make a precise distinction between subjects of one or another kingdom.⁴⁷ Many families, through marriage, godparenting, and other forms of affiliation, contributed actively to the movement of people, property, and resources between the most remote reaches of the empire. This pattern of interchange occurred across the Habsburg Empire, although it was more intense between the Portuguese and the Castilians.⁴⁸ Family, patronage, and clientele networks were often strengthened by their association with trade networks. Participants in these networks often maintained representatives in different imperial cities, promoting the circulation of goods, capital, and the knowledge tied to them.⁴⁹ This went hand-in-hand with the expansion of Portuguese trade in Asia and the consolidation of Brazil as a hub for resource extraction and immigration.

On the Spanish side, starting from 1560, there was a remarkable rise in the flow of American silver (through the Caribbean route and the Manila galleon), mainly due to the decline of Guinean gold shipments. By the early

45 John H. Elliott, “A Europe of Composite Monarchies,” *Past & Present* 137 (1992): 48–71.

46 Casalilla, *Os impérios ibéricos*, 130–160.

47 Tamar Herzog, *Frontiers of Possession* (Cambridge: Harvard University Press, 2015).

48 As shown by Herzog, *Frontiers of Possession*.

49 Ribeiro, *Early Modern Trading Networks*, 100–112.

seventeenth century, American silver was transferred to Asia to pay for the luxury products that arrived via Lisbon. These were distributed across the empire by Italian banking families, and linked to the financing of expanded sugar cane plantation in Brazil and a growing slave market on the African coast. This circuit was completed with the trade of Northern European products and the insurance and credit networks that funded most long-distance oceanic voyages, both Portuguese and Spanish.⁵⁰

This economic model depended largely on the capacity to transfer resources to elites in the form of privileges. Whether in Europe or in the colonies, from the lower nobility to the urban bourgeoisie and the wealthy peasantry, diverse sectors of both Iberian societies devoted significant energy to achieving a better placement within the system.⁵¹ A significant proportion of this effort was directed at the training and education of members of extended family communities. From the mid-1570s, there was a rise in the number of individuals from the aristocracy, mercantile, and even artisan classes heading to universities and other types of educational institutions, a trend which spread across the Iberian Peninsula. A considerable part of this movement was aimed at maritime and military careers, which absorbed large volumes of surplus capital and provided an efficient pressure valve for the tensions that resulted from distributional conflicts within family networks.

In order to make the whole system work, authorities in Lisbon and especially in Madrid demanded that the transmission of information and knowledge be as fast, efficient, and complete as possible. Knowledge became a primary tradable good, and its production—by the agents spread throughout the empire—came as a direct result of the massive resources families invested in the training of individuals, and the establishment of networks. As a commodity, knowledge therefore fed the economic reproduction of clientelist and family-based networks. In other words, the production and circulation of knowledge (and the increasing efficiency of commercial networks and credit mechanisms) sustained the imperial administration's overwhelming appetite for reliable information about the territories under its control. This was particularly important for an empire with extensive communication chains, like those of the monsoon-regulated Indian trade or the annual Manila galleons.⁵²

50 C. Marsilio, "The Genoese and Portuguese Financial Operators' Control of the Spanish Silver Market (1627–1657)," *The Journal of European Economic History* 41, no. 3 (2012): 69; James C. Boyajian, *Portuguese Bankers at the Court of Spain, 1626–1650* (New Brunswick: Rutgers University Press, 1983).

51 Casalilla, *Os impérios ibéricos*, 65–85.

52 Bracht, *Ao ritmo das monções*, 15–25 and Casalilla, *Os impérios ibéricos*, 65–85.

It is worth considering what sort of knowledge was most vital to the imperial enterprise. In the first place, knowledge for expanding and increasing the efficiency of long-distance voyages was crucial. This was generated by cosmographers, astronomers, mathematicians, and cartographers acting in a symbiotic relationship with highly specialized craftsmen, such as nautical instrument makers, pilots, and shipbuilders.⁵³ The appearance of such entanglements is among the fundamental aspects of the emergence of a knowledge society. Even if the production of a given body of knowledge was initially confined to a circumscribed milieu, their interactions outside their niche would transmit this productive capacity across society. The same process occurred in the military, where geographical knowledge was critical, and in the mercantile sector, which demanded knowledge produced in fields as diverse as navigation, law, diplomacy, and natural philosophy.⁵⁴ As a consequence, Portuguese rutters evolved from technical documents (mid-fifteenth century) into comprehensive analytical texts (sixteenth century).

Most of the Iberian rutters written after Duarte Pacheco Pereira's *Esmeraldo de situ orbis* (1505) incorporated knowledge produced in almost all of the fields just listed.⁵⁵ Their basic mandate was the collecting, organizing, and interpreting of data on sailing conditions and geographical information (which assisted cartographers in drafting accurate charts). But early modern rutters surpassed this requirement, embracing descriptions of the natural world, such as timber reserves and marine animal communities. Finally, they served as repositories of accumulated knowledge about people and their traditions, laws, and political and social organization.

As in other fields of knowledge, the ability to produce rutters transcended its initial ambit—pilots and cosmographers—and became shared by several other groups of learned individuals. Members of the administrative elite, the military, merchants, and adventurers (sometimes all in the same person) wrote rutters and sought to integrate them into economic reproduction processes, in the hope of expanding their networks of influence or even directly obtaining benefits or commercial privileges from the crown. It can be stated safely that the early modern Iberian social legitimation economy was likewise a form of knowledge economy. Throughout the sixteenth century, the production of rutters gained speed in all European nations participating in the maritime expansion. Sixteenth-century Iberian rutters

53 Leitão, "All Aboard!" 131–132.

54 Casalilla, *Os impérios ibéricos*, 90–93.

55 As discussed by Malhão Pereira, *Roteiros portugueses*.

covered virtually all known sailing routes. Often in manuscript, although with a growing share of printed works, complete rutters or fragments circulated by the thousands among seafarers, merchants, and the empire's administrative elite.

5.4. Rutters as the Critical Element in the Emergence of Knowledge Societies

To summarize, from the mid-sixteenth century onwards, a growing number of individuals mastered the knowledge necessary to produce rutters, at least in their basic configuration. Additionally, rutters came to serve broader purposes than merely guiding navigation. Due to their analytical character and wide circulation among learned European communities, rutters may have operated as scaffolding, transferring to different mental models the knowledge produced and gathered during sea voyages.⁵⁶ It seems plausible that the information about natural phenomena, environments, and peoples circulating via rutters triggered structural changes in other areas of inquiry as well.

Thus, a rutter can be understood as a technical document, valid for navigation or the production of nautical charts and maps, but also as a mental model, a specific way of reasoning and ordering knowledge about a given geographical area. Many early modern authors deliberately gave their texts the form of a rutter, which may indicate the preference of the rutter genre and its style of reasoning among those involved in long-distance voyages. The basic rutter invariably contained a narrative following a linear route, usually coastal, and data about the most important landmarks. Along the route, information about latitudes, distances, coastal profiles, and descriptions of harbors, water sources, hunting and fishing grounds, and timber reserves are given. As such texts were for more than guiding navigation; discussion of the conditions for establishing settlements could be added, often with detailed climate and soil analyses. Comments on local peoples are frequently encountered, as are strategic analyses regarding the defense of specific points on the coast (usually accompanied by reports on whether or not vessels from rival nations were present). The rutter

⁵⁶ The concept of "scaffolding structure" applied to the study of the history of transition between different mental models was proposed by Jürgen Renn, in adaptation of the theory of mental model reasoning developed by Philip Johnson-Laird and Ruth M. J. Byrne: Jürgen Renn, "From the History of Science to the History of Knowledge – and Back."

genre's basic structure allowed for knowledge of a political, economic, geographical, or natural philosophical nature. In taking on such topics, a rutter could address individuals ashore—be they patrons, politicians, or cartographers—impacting the granting of crucial resources and benefits within the distributional conflicts of imperial economic policy. Some of the most emblematic documents of this type were produced during the second half of the sixteenth century. The three documents to be analyzed in the next sections of this chapter are archetypical examples. Produced by non-professionals (that is, those unschooled in the trades of pilot, cartographer, or cosmographer), these texts are of uneven utility in navigation. In fact, it is possible that they were not even designed for such use at all.

5.5. Pero Magalhães de Gândavo

Pero Magalhães de Gândavo was born in Braga around 1540, into a family of Flemish extraction. His name is presumed to be derived from *Gantois*, a French designation for natives of Gant in the Low Countries. Historical records indicate that Gândavo owned a school in northern Portugal (where he taught Latin) and that he was appointed copyist of the royal archives at the Torre do Tombo at the end of Queen Catherine's regency (1557–1562).⁵⁷ It was during this period that Gândavo probably started writing his rutter-styled work entitled *Tratado da Terra do Brasil*. The work was undoubtedly finished before 1572, as is clear from the evidence in the text.⁵⁸ The original manuscripts have been lost, and there are only six known copies: two from the nineteenth century, one from the eighteenth century, and four others made in the seventeenth century.⁵⁹ These sources reveal that Gândavo offered his work to King Sebastião and his regents, Catherine and Cardinal Henrique.

Gândavo likely arrived in Brazil during the government of Mem de Sá between 1570 and 1572, and there is strong evidence suggesting that the *Tratado* was not based on the author's personal experience but rather on a

57 Lisbon, Arquivo Nacional da Torre do Tombo, Chancelaria de D. Sebastião e D. Henrique, liv. 37.

58 The most important evidence is that Gândavo did not mention the split of Brazil's administration between two governors, one in Bahia and the other in Rio de Janeiro, which took place in 1572.

59 Alexandre José Barbosa da Costa, "Das coisas maravilhosas e bestiais do Brasil: Um estudo sobre o gênero histórico em Pero de Magalhães de Gandavo" (PhD diss., Universidade de São Paulo, 2017).

selection of materials obtained from varied sources. Although Gândavo left no indication of these sources, it is possible to infer the type of reading from which literate individuals could obtain such information. Oral transmission aside, a range of written material about the New World circulated among the learned circles of Portugal and Spain. Some of these texts were travel accounts, logbooks, and rutters. Frequently handwritten, rutters of the Brazilian coast became more numerous from 1530 onwards, when Martim Afonso de Sousa completed an expedition of colonization, and Pero Lopes de Sousa composed his travel diary and rutter.⁶⁰ Between the 1540s and 1560s, the presence of European agents on the Brazilian coast became increasingly frequent, a trend bolstered by the arrival of the Society of Jesus in 1549. Rutters and written reports often passed through the hands of the realm's highest dignitaries, and even those of the monarch himself. Many of these documents were sent to the royal archives of Torre do Tombo, where the most important information on the kingdom's administration and overseas possessions was kept.

Gândavo's *Tratado* is a rutter in the broader sense. As a description of the Brazilian coast, it duly indicates the distances, latitudes, and navigational conditions of some bays and river mouths, but it was not a text conceived to facilitate navigation. It consists of two parts: the first dealing with the coast, and the second combining elements of natural philosophy and political discourse. It can thus be characterized as a descriptive and analytical work on geographical, natural, economic, and anthropological aspects of the territories along the coast between the captaincies of Pernambuco and São Vicente. The rutter-like structure is, in this case, a framework, allowing the author to fashion a comprehensive account of the Portuguese territories in South America. With its detailed discussion of flora and fauna, climatic conditions, and the habits and traditions of the indigenous peoples, Gândavo's *Tratado* is a complete guide to the conditions under which the colonization of the Brazilian coast was developing.⁶¹

At the end of the sixteenth century, this particular kind of text was of great strategic interest. Around 1570, the Spanish King Philip II (1527–1598) commissioned the Neapolitan cosmographer Giovanni Battista Gesio (?–1580) to secretly deliver a set of Portuguese manuscripts to Spain. The main objective

60 For a comprehensive accounting of sixteenth-century Portuguese rutters see Luana Giurgevich,

"Roteiros portugueses dos séculos XV e XVI (Manuscritos)," *RUTTER Technical Notes Series* 7, no. 1 (April 30, 2021): 52, <https://doi.org/10.6084/m9.figshare.14529084>, and chapter 1 of this volume.

61 Gândavo, *Tratado da Terra do Brasil*.

of this order was to gather information in support of the Spanish claims to the Moluccas.⁶² In 1573, Philip received a list of the manuscripts copied, among which featured several rutters, such as the *Esmeraldo de situ orbis* and a Castilian translation of Gândavo's *Tratado*. These bootlegged manuscripts ultimately became part of the Escorial library collection.⁶³ Gesio, who had accompanied Philip II's ambassador Juan de Borja (1533–1606) during his stay in Portugal, made good use of the strategic information he had amassed. Some years later, in 1578, he wrote the king six letters concerning Portuguese affairs, with intelligence on the defensive capacities of fortifications on the African coast, and advice on possible future conquests.⁶⁴

In addition to details regarding coastal sailing conditions and the location of villages, towns, and defensive positions, there was great interest in the knowledge being produced in the field of natural philosophy. Gândavo's text was, in this sense as well, a valuable document. For example, in locating the captaincy of Ilhéus, the *Tratado*, displaying all the characteristics of a typical rutter, states:

The captaincy of Ilhéus is thirty leagues from Bahia de Todos os Santos, at fourteen degrees and two thirds; it belongs to Francisco Giraldes, who has a captain loyal to him there. There may be two hundred residents there. It has a river where the ships come in ...⁶⁵

The text goes on to describe navigation through the entrance of the Cachoeira River and the dimensions of its harbor, and continues inland until reaching a large lagoon that “has an infinite number of large and small fish.”⁶⁶ What follows is a reconfiguration of knowledge, in which several different accounts of an animal (until lately unknown in Europe) were processed and framed according to the natural philosophical mental model characteristic of the Renaissance.⁶⁷ Through the recognition of sympathies and antipathies,

62 Ricardo Padrón, *The Indies of the Setting Sun: How Early Modern Spain Mapped the Far East as the Transpacific West* (Chicago: University of Chicago Press, 2020).

63 Padrón, *The Indies of the Setting Sun*.

64 Real Biblioteca del Monasterio de San Lorenzo de El Escorial: Discurso di Gio. Batt. Gesio, Mathematico di sua Mta. Catholica sopra la successione del Regno de Portugallo (registro nro. 2051).

65 “Capitania dos ilhéus está a trinta léguas da Bahia de todos os Santos em quatorze graus e dous terços; é de Francisco Giraldes, na qual tem posto capitão de sua mão. pode haver nela duzentos vizinhos. tem um rio onde os navios entram ...,” Gândavo, *Tratado da Terra do Brasil*, 40.

66 Gândavo, *Tratado da Terra do Brasil*, 40.

67 As discussed in Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (London: Routledge, 1994).

approximations and emulations, Gândavo provided one of the first analytical descriptions of a manatee:

Many cow-fish breed there, which have a snout like that of an ox's and two stumps, like arms, with which they swim; they have no scales or other fish-like features except their tails. They are killed with harpoons, and are so fat and large that some weigh thirty, forty *arrobas*. It is a very tasty fish and looks just like meat and so has the taste of it; roasted it looks like pork or venison loin, it is boiled with cabbage, and stewed like meat, and no one who eats it regards it as fish, unless they know it first. The females have two breasts through which they suckle their young; they are raised on milk (which is not found in any other fish); there are also some of these in some bays and rivers along this coast, and although they are raised in the sea, they usually drink fresh water.⁶⁸

Although we cannot know exactly which accounts formed the basis of Gândavo's analysis, there is no doubt that this knowledge about the natural world flowed in profusion between the New World and Europe. Examples abound, such as a description of the same animal made by the Jesuit priest José de Anchieta (1534–1597), sent in a 1560 letter to his superiors in the Society of Jesus. According to Anchieta's account, the animal the natives called *iguaraguá* was:

In size it is larger than an ox, it is covered with hard skin, similar in color to that of the elephant. It has in its chest a kind of wings, with which it can swim, below them are the teats with which it feeds its young. The head is in everything similar to that of the ox. It is excellent to eat in such way that it is hard to say if it should be considered fish or meat.⁶⁹

68 "Criam-se nela muitos peixes-bois, os quais têm o focinho como o de boi e dois cotos com que nadam à maneira de braços; não têm nenhuma escama nem outra feição de peixe senão o rabo. Matam-nos com arpões, são tão gordos e tamanhos que alguns pesam trinta, quarenta arrobas. É um peixe muito saboroso e totalmente parece carne e assim tem o gosto dela; assado parece lombo de porco ou de veado, coze-se com couves, e guisa-se como carne, nem pessoa alguma o come que o tenha por peixe, salvo se o conhecer primeiro. As fêmeas têm duas mamas pelas quais mamam os filhos, criam-se com leite (cousa que se não acha noutro peixe algum): também há destes em algumas baías e rios desta costa e posto que se criem no mar costumam beber água doce," Gândavo, *Tratado da Terra do Brasil*, 40.

69 "Em tamanho, excede a um boi, cobre-se com sua dura pelle, semelhante pela côr á do elephante; tem no peito duas espécies de azas, com as quaes pôde nadar, debaixo das quaes crescem as tetas, onde cria os filhos, a cabeça é semelhante em tudo á do boi. Para comer, é excellente, de modo que se não pôde affirmar se deve ser considerado peixe, ou carne," José de

This kind of knowledge about nature was systematically produced by agents spread across different parts of the globe. By framing it in the structure of a rutter, Gândavo took it out of its micro-context, connecting it to a narrative that aimed to analyze, comprehensively and articulately, a portion of the coast that stretched between the equator and the Tropic of Capricorn. Like the manatee, other elements of nature were geographically situated along this route, allowing his readers a bird's eye view of the South American coast in all its aspects. Among Portuguese authors contemporary to Gândavo, this rutter-type structure seems to have been considered particularly appropriate for articulating such a diverse body of knowledge.

The nascent Iberian knowledge societies notably retained the economic reproduction models characteristic of the *ancien régime*. Legitimation was built around the primacy of the crown in the distribution of privileges, positions, perks, or sinecures, and knowledge became an essential currency and engine of social mobility. A few years after having dedicated his *Tratado* to the young King Sebastião and his regents, Gândavo was appointed treasury officer of the captaincy of Bahia, then headquarters of the general government of Brazil. After returning to Portugal, he published the *História da Província Santa Cruz*, printed in Lisbon in 1576 and dedicated to Lioniz Pereira, third count of Feira. This publication, approved by the Inquisition and sponsored by a member of the upper nobility, is proof of Gândavo's insertion into imperial economic circuits.⁷⁰

Shortly after Gândavo's death in 1580, the dynastic crisis into which Portugal plunged since King Sebastião's death in 1578 resulted in the union of the Iberian crowns under King Philip II of Spain (who became Philip I of Portugal). The union with Spain did not diminish the importance of knowledge production as a means of economic reproduction. While attempting to rule a multifaceted empire that stretched from the Philippines to Mexico, across the Indian Ocean and the South Atlantic, the crown depended entirely on the production and circulation of knowledge to direct its human and economic resources properly. This dependency provided an excellent incentive for individuals from diverse social and intellectual backgrounds to view knowledge production as a way of taking advantage of the imperial distributive conflict. Such was the case of Gabriel Soares de Sousa, to whose work I now turn.

Anchieta, *As coisas naturais de São Vicente*, Carta ao General P. Diogo Laínes, Roma, São Vicente, 31 de maio de 1560, in *Minhas cartas por José de Anchieta* (São Paulo: Associação Comercial de São Paulo, 2004), 26–55.

70 Da Costa, "Das coisas maravilhosas e bestiais do Brasil," 64–76.

5.6. Gabriel Soares de Sousa

Produced between 1580 and 1587 in Madrid, Gabriel Soares de Sousa's *Tratado descritivo do Brasil* shares many of the characteristics of Gândavo's work. As with the latter, little information about Sousa's life is available. Probably from the low-ranking nobility, Sousa was born in Portugal around 1540, and is believed to have emigrated to Brazil around 1560, settling in Bahia, where he lived for the next seventeen years. By 1587 he was in Madrid, where he offered his manuscript to Cristóvão de Moura (1538–1613), an influential Portuguese nobleman long established at the Spanish court. This decision was nothing if not fortuitous; Moura's ascendancy over the Portuguese nobility was such that he was twice named viceroy of Portugal. At the center of intricate patron-client networks, Moura was a crucial liaison between the Portuguese nobility, the crown, and imperial institutions. By means of his engagement with various informal networks and the power this won him, Cristóvão became essential to King Philip II in the administration of Portuguese affairs and the management of his unwieldy composite empire.

The manuscript Sousa presented to Cristóvão was divided into two parts. The first part, “Roteiro geral com largas informações de toda a costa do Brasil,” (General Rutter With Wide Information on All the Coast of Brazil) is a rutter describing the coast of South America from the proximities of the Amazon River mouth to the estuary of the Rio de la Plata.

The second, “Memorial e declaração das grandezas da Bahia de Todos os Santos, de sua fertilidade e das notáveis partes que tem,” (Memorial and Account of the Greatness of the Bahia de Todos os Santos, its Fertility, and the Notable Features it Possesses). is a comprehensive descriptive and analytical work about the captaincy of Bahia. Sousa's “Memorial” includes knowledge regarding diverse environmental, botanical, hydrographical, and anthropological topics, and remains one of the most important documents ever produced about sixteenth-century Brazil.

The two texts are complementary: while the first offers an aerial view of the coast of South America, the second zooms in to closely examine the wealthiest and most developed Portuguese colony in the Americas. Both draw upon multiple bodies of knowledge. Like Gândavo's text, although more precisely, Sousa's rutter indicates latitudes and distances and provides data on depths, rocks, coastal features, and sandbanks—it is suitable for sailing. Given the ample non-navigational content Sousa includes, however, the rutter genre seems to be employed as a tool to construct knowledge in other fields as well.

In many ways, Sousa's rutter of the Brazilian coast bears a great resemblance to its counterpart by Gândavo. Both were compiled from information obtained indirectly, whether from oral accounts or the manuscript sources that circulated widely in the Iberian Peninsula at the time. Unlike Gândavo's rutter, though, Sousa's text is replete with references to these sources.

For example, when writing about the mouth of the Amazon River, Sousa admitted to having drawn on reports from Francisco Orellana's voyage of 1542 (although the exact sources he consulted are not specified). Portuguese explorers and pilots are also mentioned, as is the case of a certain Luís de Melo, the son of the *alcalde-mor* of Elvas, who was sailing along the coast when he got lost in the shallows of the Amazon River and supposedly found Spanish soldiers—deserters from Orellana's expedition—living among the local people.

More illuminating with regard to the materials on which Sousa relied to write his rutter is the passage in which he describes the estuary of the Maranhão river:

This river of Maranhão has at its mouth—between the banks and inwards from them—an island called “das Vacas,” which is three leagues long, where Aires da Cunha was when he was lost with his armada in these waters;

And here on this island were also the sons of João de Barros and there they had a settlement, when they were also lost in the shallows of this river, where they made peace with the Tapuia people, who have populated part of this coast, and up this river, where they sent to buy provisions and other things for their sustenance.

Through this river entered Bastião Marinho, a coastal pilot, with a small caravel, and he went up it for about twenty leagues, where he found many islands full of trees and their land steep, with a passable depth; and many branches into which many rivers flow, joining this one. He stated that all the land was lush, full of forest, and inhabited by people, as were the islands. Into this river flows the Pindaré, which comes from very far away.⁷¹

71 “Tem este rio do Maranhão na boca—entre ponta e ponta delas para dentro—uma ilha que se chama das Vacas, que será de três léguas, onde esteve Aires da Cunha quando se perdeu com sua armada nestes baixos; e aqui nessa ilha estiveram também os filhos de João de Barros e aí tiveram povoado, quando também se perderam nos baixos deste rio, onde fizeram pazes com o gentio tapuia, que tem povoado parte desta costa, e por este rio acima, onde mandavam resgatar mantimentos e outras coisas para remédio de sua manutenção. Por este rio entrou um Bastião Marinho, piloto da costa, com um caravelão, e foi por ele acima algumas vinte léguas, onde achou muitas ilhas cheias de arvoredo e a terra delas alcantilada com sofrível fundo; e muitos braços em que entram muitos rios que se metem neste, o qual afirmou ser toda a terra

Sousa had access to the information gathered by pilots and other professional seafarers, and their rutters or logbooks. Throughout his text, Sousa mentions several other pilots, cosmographers, and explorers from whom he acquired the data needed to compose a rutter that described about eight thousand kilometers of coastline in great detail. One can infer that alongside the classics (the works of Pliny and Ptolemy, for instance), rutters and logbooks were recurrent reading for Sousa.

The knowledge Sousa transmitted responded to the crown's needs and interests, as in the passage relating the experience of a pilot named Nicolau Resende, who, while negotiating the shallows of the Jagoaripe River, witnessed immense palm forests stretching many miles inland. At the same time, Sousa's text references things like the marine fauna that could be found along the coast.

In the second half of his work, Sousa deliberately abandoned the rutter-like structure, switching to another style popular in the second half of the sixteenth century: the treatise. In this part, Sousa describes and analyzes the elements of the natural world, plants, and animals, and also addresses the human, geographical, and economic aspects of the region around the Bay of All Saints.

Sousa's text enjoyed wide circulation. According to Francisco Adolfo Varnhagen (1816–1868), a pioneer in the study of Sousa's rutter, several copies were made even before the end of the sixteenth century, and excerpts have been found in the manuscripts of other writers. An exhaustive study by Luana Giurgevich identified twenty-three copies produced in Portugal and Spain between the end of the sixteenth century and the first half of the seventeenth century.⁷²

By offering his manuscript to Cristóvão de Moura in the context of the legitimization economy of Iberian societies, Sousa sought to have more straightforward access to credit markets and clientelist networks in order to finance an expedition in search of supposed emerald deposits in the Brazilian hinterland. That is, the knowledge produced by Sousa became an asset to be exchanged within the economic reproduction mechanisms of the empire. Through the intervention of Cristóvão de Moura, Sousa obtained resources from multiple sources, including the crown itself. He probably died from a fever on the longed-for expedition, in the mountains of Chapada Diamantina, around 1592.

fresca, cheia de arvoredos e povoada de gentio, e as ilhas também. Neste rio entra o de Pindaré, que vem de muito longe." de Sousa, *Tratado descritivo do Brasil*, 76.

72 See Giurgevich, "Roteiros portugueses dos séculos XV e XVI (Manuscritos)," 97–101.

5.7. André Donelha

On November 7, 1625, André Donelha, a merchant and ship-owner operating in the Portuguese trading networks in Guinea, offered his *Descrição da Serra Leoa e dos Rios da Guiné e do Cabo Verde* to the governor general of the captaincy of Cape Verde, Francisco de Vasconcelos da Cunha. Donelha's origins are uncertain, although it is known that he was the son of an Italian merchant who settled in Cape Verde in the 1550s. In the 1570s and 1580s, he participated in military expeditions fighting the French and several local kingdoms threatening Portuguese commercial activities in the region. He established himself as a merchant on the island of Santiago, and traded with the inhabitants of the Guinea coast, exchanging European products for slaves and ivory. He was a contemporary of André Álvares e Almada, a prestigious mixed-race merchant (his father Portuguese, and mother Bantu), and author of the *Tratado breve dos rios de Guiné do Cabo-Verde* (1594), although in Donelha's text, there is no reference to this author or his work. Donelha's manuscript was included in the then-governor of Cape Verde's administrative archives and accompanied the governor when he was transferred to Angola.⁷³

Donelha's *Descrição* is a rutter, composed in the consolidated style of the genre, containing exhaustive data on navigation, latitudes, and distances and, above all, the variability of tides and winds (essential for safe passage through the dangerous shallows of Guinea). At its core, though, Donelha's manuscript is a diplomatic and commercial treatise. It deals with coastal and hinterland peoples in great detail, touching on the geographical boundaries between local kingdoms, their history and political structures, and cultural aspects. With this text, Donelha sought to determine the best way to establish commercial and diplomatic relations with the peoples with whom the Portuguese were in contact. With Donelha's *Descrição* in hand, colonial administrators could avoid (or mediate) conflicts, and would know precisely where and how to allocate human, economic, and military resources.

Conclusion

The three rutters outlined above share several characteristics. First, they were produced by individuals who were engaged in the colonial enterprise,

73 Avelino Teixeira da Mota, "Sobre o Autor," in André Donelha, *Descrição da Serra Leoa e dos Rios de Guiné do Cabo Verde* (1625): *An Account of Sierra Leone and the Rivers of Guinea of Cape Verde* (1625) (Lisboa: Junta de Investigações Científicas do Ultramar, 1977).

but who were not necessarily professional navigators, nor part of the learned circles of astronomers, cosmographers, and cartographers connected to maritime activities. Another point in common is that the knowledge presented in the three texts was built from heterogeneous sources, such as the rutters of Duarte Pacheco Pereira (1506) and Pedro de Sousa (1530). Additionally, the three authors made extensive use of the knowledge acquired through their informal networks (pilots, merchants, colonial authorities, and inhabitants of the regions described). In this way, they collected, organized, and analyzed knowledge produced dispersedly, whether over long distances or via individuals acting as hubs connecting disparate contexts.

Such knowledge could be exchanged along the typical reproductive pipelines of the *ancien régime* economies. For local or imperial authorities, it was strategic knowledge that could guide decision-making. In another sphere, individuals belonging to diverse groups (e.g., merchants, artisans, traders, and scholars) could use the knowledge available in these rutters to prospect business opportunities, regulate the credit market and maritime insurance, search for exotic new products, learn about medicinal drugs, or access information that could advance existing knowledge in other fields of inquiry.

Given their potential to promote the movement and reconfiguration of knowledge, and their connection to economic reproduction processes, rutters can be considered critical elements in the construction of early modern colonial empires. By percolating transversally among social strata and across a broad imperial network, rutters acted as links between worlds, a basis upon which significant changes in the structures of knowledge could be effected. Finally, since they were inserted, through the action of informal and self-organized networks, into economic replication chains ranging from the imperial administration to the mercantile communities operating in small territories, rutters were essential to the emergence of a knowledge society within the Iberian empires and, possibly, within early modern Europe more generally.

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6. The Problem of Relational Cardinality, the Sixteenth-Century Atlantic, and the Making of the Globe

Luis Lobo-Guerrero

Abstract: How do ideas and practices of cardinality, global spatiality, and global space relate in making global governance possible? This is a problem at the core of ideas such as the international and the global that characterize the modern period from the sixteenth century onwards. This chapter explores, through a historical epistemological analysis of Juan de Escalante de Mendoza's *Itinerario de Navegacion*, how this was a problem of relationality. It involved shifting conceptions of ocean space, European spatial identity, as well as the standardization of wayfinding practices. The resulting cardinalization of space was as much the answer to a pressing logistical problem (the training of pilots) as it was one to the problem of governing novel global spaces.

Keywords: cardinality, sixteenth-century wayfinding, early modern globality, historical international relations, historical spatiality.

6.1. First Problem: Making the “Spacious Ocean”

The statement that the late fifteenth and early sixteenth centuries were the period in which global space was invented might at first appear insubstantial. To reflect upon the notion of space, however, permits an understanding of why this seminal moment changed the conception of global order and governance for what was later understood, in Europe, as modernity, and the kind of globalizing economy that followed. It opened up the possibility of beginning to think, around a century later, of the territorial nation-state system, and its allied ideas of sovereignty.

So, in retrospect, what was novel about the conception of global space that appeared in the late fifteenth and early sixteenth centuries? To begin with, it is necessary to emphasize that the transformation at hand, greatly influenced by Iberian-led oceanic ventures, had nothing to do with the myth of confirming the roundness of the earth. Indeed, this had been common knowledge since the time of Erathostenes.¹ Nor was it about getting to new lands for the first time, since the Iberians had no expectation of finding a new continent (although, as archaeological evidence has now shown, Nordic sailors had been there before). It was, instead, about materializing a physical maritime connection between two well-known areas of trade and governance, which can be roughly termed the West and the East; making such a connection operable through stable shipping routes; and being able to exercise power over the lands and peoples through which such links were to be made possible. The fact that a whole continent lay in between made the endeavor far more interesting.

If a new way of thinking about global space is to be theorized, a key issue was to render the known world amenable to trade, exchange, and governance, through the establishment of stable maritime routes. This was as much a physical and practical endeavor as it was an intellectual one, as will be shown. The transformation it brought about (as the Magellan-Elcano expedition of 1519–1521, and multiple others demonstrated) was not just one of scale, but one which demanded an active spirit of invention, creativity, resourcefulness, and deftness in combining and creating forms of knowledge, and negotiating the interactions of situated spatial empirical experience with higher-order theoretical reflections. The problem of cardinality in the sixteenth century, as will be discussed below, was at the core of this process.

The purpose of making global space was pragmatic. Forging a new connection with the East, this time maritime, to obtain precious commodities and sell them in European polities, was not only commercially desirable, but would obviate the role of the Ottoman in mediating the corresponding land-based routes. Opening up new spaces of navigation and creating new spatial links required, using today's terms, infrastructure and services, based on some form of normalized (disciplined) knowledge, standards, routines, protocols, and governance.

A (stable) route is an instance of governed space. It can be argued that the existence of a stable route is an effect of the complex coordination of agency and structures which require very precise forms of power, and the

1 Cf. Jeffrey B. Russell, *Inventing the Flat Earth: Columbus and Modern Historians*, rev. ed. (Westport, CT: Praeger, 1997).

operation of governance from a distance. As is well known in the literature,² space and governance are but intellectual categories that characterize ways of being-in-the-world with some form of order. This is important because it is in this respect that spaces need to be thought of as *created*, and governance needs to be conceived of as *made to happen*.

A critical reader might at this stage challenge the notion of spaces being “created” in these European maritime ventures, since many of the places being visited had been occupied by and known to local peoples well before explorers and conquerors arrived. Such an idea could be considered a Eurocentric view of global spatiality. The criticism would be fair if space were atemporal and universal, meaning that all people at all times had a similar or compatible conception of space. It is widely acknowledged by now that the term “space” (in the sense in which it is being used here) originates in the early modern period and was required for a very particular “Western” way of understanding being-in-the-world. It is interesting in this respect to observe, as John R. Gillis has noted, how such an endeavor of creating space could be viewed as a prerequisite for the formation of “European identity”—thus, the study of such ventures could shed light on the making of Europeanness in this period.³

For global space to be conceivable, however, a shift in the understanding of what an ocean meant was necessary. This implied a perceptual change from seeing the ocean as an obstacle, an “impenetrable swamp” of dangers and monsters, to one in which it was a space to be mastered, harnessed, and governed. To put it differently, for an idea of global space, the global had to be conceived of as a space for connectivity. It could be argued that this notion allowed Europeans to begin to see themselves as situated at the center of their world. In such a reframing of space, Europeans were no longer a people on the periphery of the Afro-Eurasian block, but possessed a frontier of their own to explore and claim.⁴ In that respect, the making of globality in the fifteenth and sixteenth centuries expresses a European conception of space that is globalized through colonization, and is in turn constitutive of European identity.

2 E.g., Henri Lefebvre, *The Production of Space*, trans. Donald Nicholson-Smith, 1st ed. (Oxford: Wiley-Blackwell, 1992); Michel Foucault, “Security, Territory and Population,” in *Ethics: Subjectivity and Truth*, ed. Paul Rabinow (New York: The New Press, 1997).

3 John R. Gillis, “Islands in the Making of an Atlantic Oceania, 1500–1800,” in *Seascapes: Maritime Histories, Littoral Cultures, and Transoceanic Exchanges*, ed. Jerry H. Bentley, Renate Bridenthal and Kären Wigen (Honolulu, HI: University of Hawaii Press, 2007), 21–37. <https://doi.org/10.1515/9780824864248>.

4 Gillis, *Islands in the Making*.

When exploring the epistemological details of how this happened, it is necessary to put aside for a moment imperial and decolonial narratives, important as they may be, and observe that spatial knowledge was never of a single kind. The making of global spatiality tells multiple stories of received, emerging, and created spatial *knowledges* in constant interoperability. The resulting account of the emerging spatial conception of globality highlights forms of syncretism pertaining both to cosmologies and governance.

At the crux of this European awareness and geopolitical confidence was the settlement of a long-standing rivalry in the understanding of space in the Eurasian world. Wright described how the classical Mediterranean model of land and sea, where “a single sea encircling a limited ecumenical body of land,” came to compete with a continental model, “in which seas were separated from each other by extensions of dry land.”⁵ Lewis showed how the coexistence of these models finally dissolved in favor of a “(modified) oceanic model, ... [with] the completion of the voyage of Magellan and Elcano.”⁶

When Iberian expeditions began to establish oceanic routes, they were already practicing a form of globality that assumed global space as a locus for connectivity. The tension thus arose not from spatial models, but from how novel spaces (and the forms of connectivity that resulted from their construction) should be ordered (governed). Jones has traced, for example, how a tension between the bureaucratic planning of oceanic voyages by the Casa de Contratación in Seville (for Spain), an entity established to manage all trade with the Americas, and the Casa da Índia (for Portugal), arose with the practice and experience of voyagers. The relationship between what he called “universal detached bureaucracy” and local “contingent sailor practice” affected the dynamics of how imperial control extended over areas of “uneven and limited physical control,” such as the oceans. While bureaucratic influence shaped the voyages to some degree, ultimately it was the sailors’ experience that produced the new vocabulary, and knowledge, required to apprehend this new global maritime space.⁷ In a similar vein, Brendecke has shown how the “epistemic setting” of governance in Castile’s

5 J. K. Wright, *The Geographical Lore of the Time of the Crusades* (New York: American Geographical Society, 1925), 19.

6 Martin W. Lewis, “Dividing the Ocean Sea,” *Geographical Review* 89, no. 2 (1999): 188–214, at 191, <https://doi.org/10.2307/216086>; see also J. H. Parry, *The Discovery of the Sea*, new ed. (Berkeley: University of California Press, 1981), ix.

7 Brian Patrick Jones, “Making the Ocean: Global Space, Sailor Practice, and Bureaucratic Archives in the Sixteenth-Century Spanish Maritime Empire” (PhD diss., University of Texas, Austin, 2014), <https://repositories.lib.utexas.edu/handle/2152/28409>.

courts and institutions was at odds with that of mariners and voyagers, literally at sea.⁸ When Pedro de Medina wrote in 1545 “that the ocean was spacious,” as noted by Jones,

he was articulating a change in the conception of oceanic space driven by the Iberian-led explorations. Where previous generations of Europeans had conceived of marine space being of two sorts—the space bounded by its connections to terrestrial ports and the space beyond—Medina imagined a single oceanic space that spanned these categories.⁹

This was the novel global space that concerns modern thought.

6.2. Second Problem: Cardinalizing Space

What, then, does cardinality have to do with the creation of global spatiality in the sixteenth century? To pose such a question implies accepting that cardinality did play a role in this transition, and that a particular form of global spatiality was birthed in the sixteenth century. These two premises are not simple and, if adopted, have significant consequences for the reading of global space in this period.

Let us take this in parts. Ideas of globality change in time and have shifting references. They relate to specific ways of being in the world; to living, with regard to location; to how life is organized and sustained; to the simultaneous existence of communities in other areas; and to an expectation that there is a world out there that may be subject to interaction and intervention.

In the context of this chapter, globality is taken to relate to an awareness of an imaginary of space that covers the globe. The idea of the globe, however, is not a transhistorical/cross-cultural constant—there are multiple historical accounts of the world as a globe going back to ancient civilizations, each with its own specificities. The particular idea of the globe arising in the late fifteenth and sixteenth centuries assumed the possibility of a circumnavigational space, which was officially confirmed by the completion of the Magellan-Elcano expedition. This quickly led to an understanding of space as a domain for potential intervention, where mastery of the art of

8 Arndt Brendecke, *The Empirical Empire: Spanish Colonial Rule and the Politics of Knowledge* (Berlin: Walter de Gruyter, 2016).

9 Jones, “Making the Ocean,” 181–182.

sailing, of harnessing the elements that make this form of oceanic navigation possible, is crucial.

Once such a view of the globe is adopted, there is no such thing as empty space. If the globe operates as a container for global space, what comes next is an understanding of its content, i.e., that which is contained, as either “continent,” or as medium to it. In other words, land and water. Water operates as the channel through which land could be reached. And land is the substance upon which human beings organize their permanent dwelling.

It is not surprising, then, that the term “continent” made its way into modern European languages in this very period. A continent, understood as “a continuous tract of land” appears in the mid-fifteenth century as a translation of the medieval Latin *terra continens*, continuous land, where the participle of *continere* refers to holding together and enclosing.¹⁰ The art of long-distance sailing was about reaching land surrounded by water. Simple as it seems, this was in fact a very complex matter, as is detailed across the chapters of this volume. It necessitates knowledge of phenomena that affect navigation at sea; logistical forethought to support voyages protracted in time; and of course, wayfinding, affected by winds, sea currents, and magnetic declination.

In their oceanic voyages, European mariners and explorers encountered entities that contemporary systems of knowledge could not readily make sense of. The Renaissance sailor was exposed to phenomena for which there was no adequate correspondence in the corpus of Western knowledge.¹¹ Resolution of this problem required breaking away from a medieval tradition through resemblance and recombination.¹² Novelty in this period begins to assume an understanding that involves what I have referred to elsewhere as “committing empirical acts in a pretension of originality,” “creating empirical spaces in an interest for invention,” and “empirical dexterity in the curiosity for the strange.”¹³ In simple terms, the Renaissance mariner

10 “Continent (n.),” *Etymonline: Online Etymology Dictionary*, https://www.etymonline.com/word/continent#etymonline_v_36302.

11 E.g., Anthony Grafton, April Shelford, and Nancy G. Siraisi, *New Worlds, Ancient Texts: The Power of Tradition and the Shock of Discovery* (Cambridge, MA: Harvard University Press, 1995).

12 Michael North, *Novelty: A History of the New*, new ed. (Chicago: University of Chicago Press, 2013); Luis Lobo-Guerrero, “Novelty and the Creation of the New World in Sixteenth-Century Spain,” in *Imaginaries of Connectivity: The Creation of Novel Spaces of Governance*, ed. Luis Lobo-Guerrero, Suvi Alt, and Maarten Meijer (London: Rowman & Littlefield, 2019); José Antonio Maravall, *Antiguos y modernos: La idea de progreso en el desarrollo inicial de una sociedad* (Madrid: Sociedad de Estudios y Publicaciones, 1966).

13 Lobo-Guerrero, “Novelty and the Creation of the New World in Sixteenth-Century Spain.”

and explorer were engaged in the “creation” of knowledge, an observation that should not be taken lightly.

This leads us to the second premise of the initial statement, that cardinality played a role in the genesis of global spatiality in the sixteenth century. If global space was contained, and the object of long-distance sailing was to reach land, directionality was a central aspect of this goal and of the creative process of space-making. Regardless of the fact that directionality has always played a role in navigation, the problem of “where to head to” (*la derrota*, in Spanish) begins to acquire particular characteristics. This can be problematized as a *referential issue* that relates to the constitution of standard practices (including procedures, references, conducts, and measurements). Such a framework allows for the circumscription of the process of creating global spatiality to a particular, if contentious and evolving, way of living in the world.

Literally speaking, cardinality refers to levels of primacy or importance. Like the cardinals of the Catholic church, cardinal means a constitutive entity. In a Catholic ecclesiastical order, cardinals vote to elect a pope. In mathematics, cardinal numbers are finite sets, commonly referred to as counting numbers (1, 2, 3 and so on). They are complete, exact quantities without variation, which stabilize an understanding of units.

Etymologically, the word cardinal derives from the Latin *cardo*, the street running from north to south through the center of a city. Its perpendicular line would have been the *decumanes*, with an east-west orientation.¹⁴ In this context, the role of cardinality was to impose a spatial urban order by serving as reference for locations within a city. This element of order is of paramount importance when we embark on an analysis of cardinality and space-making.

Geographically, cardinal points serve as stable references from which to understand position, and traditionally such a role was linked to cosmological and mythological dimensions. Societies have given them different names over time, and such names relate to the use to which cardinality has been put for practices such as agriculture and mobility, or religion and politics. In Chinese mythology, the four symbols, or images, that appear in the Chinese constellations along the ecliptic are the Black Tortoise of the north, the Vermilion Bird of the south, the Azure Dragon of the east, and the White Tiger of the west.¹⁵ Each creature has an association

14 Robert James Forbes, *Studies in Ancient Technology*, vol. 2 (Leiden: E. J. Brill, 1955), 163.

15 E.g., Laird Scranton, *China's Cosmological Prehistory: The Sophisticated Science Encoded in Civilization's Earliest Symbols* (Rochester, Vermont: Inner Traditions, 2014).

with a season and element, relates to an origin story, and plays a cultural role in the wider East Asian sphere.¹⁶ In Greek mythology the Anemoi were wind gods corresponding to a cardinal direction, with Boreas in the north, Notus in the south, Zephyrus in the west, and Eurus to the east.¹⁷ Homer and Hesiod distinguished between the benevolent seasonal winds just mentioned and the malignant and destructive storm winds produced by the monster Typhoeus.¹⁸ Benevolence represented order and stability, in contrast to the unpredictable violence of storms. In Nordic mythology, from which the cardinal names currently used in many parts of the world derive, these were represented by four dwarfs that upheld a heavenly dome: Nordri for north, Sudri for south, Austri for east, and Vestri for west.¹⁹

Geopolitically, however, cardinality relates to the instantiation of order in space and time. Within a given early modern Western cosmology, it participates in the formation of a global spatial idea of order and stability, if dynamic and complex, that provides societies with stable references for life and governance. Order here is understood with respect to the way of life it is meant to promote and protect. That is, it reflects the values that a society considers worthy of promotion and protection, and engenders a correspondence with customs deemed morally acceptable. It follows that the meaning and form of “order” is subject to change, as ways of living in the world undergo transformation. This applies to mundane everyday activities such as food production or mobility, and to territorial and religious organization.

That labels of Germanic origin were eventually adopted in the modern era to refer to cardinal points is an example of this. It signals a shift from a classical imaginary of space (the space that the ecumene of the Greco-Roman world acknowledged, and which persisted up to the Renaissance), to that of modern globality: that is, from a known world to one of discovery and invention, within a global space operating as a frontier. It signals the adaptation of geographical cultures to an emerging need for stable long-distance maritime travel.

16 Anthony Christie, *Chinese Mythology*, 2nd impr. (London: Hamlyn, 1973).

17 Kora Neuser, *Anemoi: Studien zur Darstellung der Winde und Windgottheiten in der Antike* (Rome: G. Bretschneider, 1982).

18 E.g., Homer, *The Iliad*, ed. Peter Jones (London: Penguin Classics, 1992), IX, 4–6.

19 Timothy R. Tangherlini, *Nordic Mythologies: Interpretations, Intersections, and Institutions* (Berkeley: North Pinehurst Press, 2014).

6.3. Third Problem: The Practice of Cardinalizing Space in the *Itinerario* of Escalante de Mendoza

The Iberian-led experiences of oceanic sailing and space-making in the late fifteenth and sixteenth centuries are full of empirical material from which details of how cardinality mattered for sailors of the time can be explored. I will focus on a sailing itinerary written for the purpose of textualizing expert practitioners' knowledge in the art of navigation. Such works may be interrogated epistemologically, asking what the practices they describe might reveal about their actors' understanding of the world they operated upon. They are not taken here as sources of truth and facts, but as sources from which we might uncover *how* truths and facts came to be understood. In other words, I approach the itinerary as a site from which to investigate the conditions of possibility for the thoughts they profess. In such way, they are ideal material for conducting historical-epistemological analyses that help us explore higher-order problems, such as the creation of space in the early modern period.

Let us examine this possibility through two passages in Juan de Escalante de Mendoza's 1575 *Itinerario de Navegación de los Mares y Tierras Occidentales* ("Sailing Itinerary of the Western Lands and Seas"; henceforth, *Itinerario*), a text which, as will be explained below, was intended to aid in the training of new pilots on the routes of the *Carrera de Indias* (connecting Seville with the Indies). It was written as a dialogue between an apprentice, Tristán, and the pilot of a ship sailing to the Indies in the second half of the sixteenth century.

The first excerpt I will highlight comes from a rather long (but substantial) quote that tackles the problem of cardinality towards the end of the sixteenth century. To a question from the apprentice, the pilot responds:

It is convenient, sir, that you understand the names we mariners give to the four angles or points of the world so that based on that, the part named Occident can be understood.

And it is thus that we, who navigate the roundness of lands and waters of the globe, always have our imagination partitioned in four equal parts for which we imagine a man who stands, with opened arms as in a cross, pointing with the right arm at the North Pole, which part we call Septentrional.

And the back given to the rhumb of *Leste*, which is the part from which the sun rises in the morning, above the horizon, and which we call Oriental. Pointing in the same way with the left arm towards the South Pole, where the sun is seen at midday, which we call Meridional.

Facing the west rhumb, which is where the sun sets at night and which we call Occidental ...

And this account and repartition, it must be observed, *relates to the horizon of whomever considers it*, because this man we imagine standing on land ... when walking or sailing on any of the thirty-two rhumbs of the compass, would change the name of one to the other, assigning seas and lands to different rhumbs than those assigned to them before he left the point of departure.

It would be as if we, who are at present at this port of Sanlúcar and have the Cape of Saint Vincent at our Occidental part, and for that reason we call it Occidental land, and if we went and sailed from here around that Occident until the Azores Islands, we find the Cape of Saint Vincent at the Orient, and so being we would call it Oriental land. And according to this example going or sailing on any of the other thirty-two rhumbs of the navigational needle.

And so that there is no confusion in what you come to write about these dialogues, we shall call Occident, in the discourse of our navigation, the seas and lands located within the eight fourths from southeast to northeast, *with respect to where we are now*.²⁰

This passage poses the problem of cardinality in relation to two dimensions which have weighty epistemological consequences. On the one hand, the situated experience of the observer, and on the other, an agreed-upon point of reference. This apparently banal distinction became especially meaningful during the sixteenth century, when mariners sailed as they were taught in their apprenticeship and navigational standards were not the norm. What is significant here is not that cardinal points change, but how mariners ought to employ them in their route making, route finding, and route marking.

At a time when navigational routes were established not through maps, but by descriptions, mostly verbal and sometimes written, and when the role of apprenticeship and situated empirical experience mattered greatly, the location that counted was that of the observer who navigated. Mariners learned to find their way through knowledge of the environment, signs of nature, and the experience of others. It was only in the seventeenth century that geographical coordinates, in the style used by Mercator's projection, began to be used for navigation (and even then, mostly in official documents of governments and business).

20 Juan Escalante de Mendoza, *Itinerario de Navegacion de Los Mares y Tierras Occidentales 1575* (Madrid: Museo Naval, 1985), 65–66, emphasis added, translation mine.

The difference between a situated experience of location/sense of direction (e.g., taking one's bearing from a specific place), and one based on established reference points or lines (e.g., the Greenwich meridian) comes to the fore when setting standards on how and when routes are to be traveled. As a political scientist, I view this phenomenon as one of power relations, whereby routes become objects of governance for the purpose of efficiency, order, and, in this particular case, imperial control. This was precisely context in which Escalante de Mendoza wrote the excerpt above, and it justifies a deeper discussion of his background, to which I now turn.

Juan de Escalante de Mendoza (ca. 1545–?) was a captain in the *Carrera de Indias* (henceforth, *Carrera*), the Spanish commercial route established in the early sixteenth century linking Seville with the Americas through the Caribbean.²¹ Although he enjoyed a privileged upbringing, his training as a mariner was fairly typical of the period.²² Having been apprenticed by his uncle, a captain in Seville, he acquired his own ship by age eighteen, and acted as master, pilot, and later, captain of *naos* of the fleets in the *Carrera*. At the time of writing his *Itinerario* he was presumably a captain; by 1595 he was *Capitán General de la Armada y Flota de la Nueva España* ("General Commander of the Navy and Fleet of New Spain"),²³ a highly desirable post in the Spanish naval establishment.

The purpose of his *Itinerario* was to address an urgent practical problem within the fleets of the *Carrera*: the lack of uniformity and quality of knowledge among marine officers at a time of commercial and political expansion of the Iberian kingdoms. This was an era marked also by the development of two economic and political pivots in the Hispanic Americas: one in New Spain (Mexico), and the second in Lima (Peru), both driven by the production of silver. In response to the demands of the moment, a two-fleet system began to operate by 1536, which was reorganized by a *cédula real* in 1561 due to the operational problems it faced. The first fleet, that of New Spain, would concentrate on the routes between Seville and Veracruz, with a variant to Honduras and would depart from April to May. The second, that of *Tierra Firme*, would sail between Seville and Nombre de

21 Sergio Rodríguez, *La Carrera de Indias (La Ruta, Los Hombres, Las Mercancías) / La Huerta Grande* (Madrid: Esles de Cayon, 2012), <http://www.lahuertagrande.com/publicacion/la-carrera-de-indias-la-ruta-los-hombres-las-mercancias/>.

22 See Pablo E. Pérez Mallaina, *Spain's Men of the Sea: Daily Life on the Indies Fleets in the Sixteenth Century*, tr. Carla Rahn Phillips (Baltimore: Johns Hopkins University Press, 2005), <https://jhupbooks.press.jhu.edu/title/spains-men-sea>.

23 Escalante de Mendoza, *Itinerario de Navegacion de Los Mares y Tierras Occidentales 1575*, 10–11.

Dios/Portobello with departures in August, and would handle commerce with Peru across the Isthmus. Each fleet would be escorted by an armada (an armed naval escort), would winter in America, and would reconvene in Havana in March for a return voyage, escorted by the joint armadas in the form of a war fleet.²⁴

The fleet system, and the growing volume of vessels and cargo on the move (with its associated logistical, nautical, naval, and manpower needs), required some form of what today would be called standardization of knowledge, procedures, and practices. Escalante de Mendoza's contribution to the problem, as he notes at the start of the *Itinerario*, was to put his expertise in the service of the crown (and the Catholic faith) by providing a text that would help mitigate the ignorance, lack of experience, and risky behaviour of (mostly) masters, pilots, and captains.²⁵ He did so by means of a Socratic dialogue between an apprentice, Tristán, and a well-experienced pilot sailing from Seville to the Caribbean with the New Spain fleet. The pedagogical style chosen, in line with classical Greek and Latin texts, allowed him to use the curiosity of the student to seek answers he thought an apprentice would be required to know; and let the wisdom, knowledge, and experience of the master shine, whilst circumventing the problem of social class and rank that at times characterized the higher echelons of the command of the fleets. Rather than using the patronizing language of master to acolyte, Escalante de Mendoza fostered humility in the reader so that they might absorb the latest in cosmography, navigation, and a little of the art of war at sea—and did so in a way that would not insult a hierarchical order.

In sum, the *Itinerario* was intended to address a problem in the training of nautical officers and to create a commonality of knowledge that would allow for the safer operation of fleets in the *Carrera*. Although so intended, the text was found to be of such strategic relevance that authorities at the Council of the Indies, advising the king on all American matters, kept it unpublished to prevent enemies and competitors from using it. It was only published, as an antiquarian text, in 1880.

The text is here employed as a historical-epistemological source that allows a reflection on the problem of cardinality. Moreover, it constitutes a privileged epistemic source, given how Escalante de Mendoza blended practical situated knowledge of the profession and the routes with the

24 Pierre Chaunu, *Sevilla y América siglos XVI y XVII* (Sevilla: Universidad de Sevilla, 1983), esp. 196–197.

25 Escalante de Mendoza, *Itinerario de Navegacion de Los Mares y Tierras Occidentales 1575*, 20.

cosmographical science of the era. The question guiding this inquiry is not what cardinality meant, then, but how “practitioners” of navigation and the art of sailing understood it, empirically and theoretically, and what sets of beliefs, practices, knowledges, and disciplines participated in its construction.

To set up the epistemological site that could be explored in more detail in subsequent work, I will now highlight some salient aspects of this excerpt.

First, note the group identity underlying the statement. The pilot refers to “we mariners,” pointing to a group of people who practice navigation at sea with a particular collective consciousness. Throughout the *Itinerario*, mariners are depicted as members of a highly specialized profession, with a hierarchy of knowledge and practice, with levels of recognition and authority deriving from the institutions of the crown, with specific empirical and theoretical knowledge, with faith-related elements (such as particular saints they venerated), and with ways of disciplining members into a particular order. As a corporate body, the statement claims “their” way of giving “the four angles or points of the world” a name. In this case, for the purpose of understanding “the part named Occident.”

This leads to the second observation, regarding the “Occidental” alignment of the mariner’s imaginary. The pilot’s statement (“so that based on that, the part named Occident can be understood”) begs the question: why Occident and not Orient, or north, or south? The answer lies in a chief spatial concern of the Spanish enterprise of the time: to sail west to reach the East, as elaborated recently by Ricardo Padrón.²⁶ An occidental spatialization stamps the imaginary of the Hispanic mariner of the time—Occident is what the mariner “faces,” and all cardinal references are subordinate to that angle. There is of course much more to explore here; for the present, it is sufficient to note that an Occidental spatial imaginary is a radical shift from the easterly one found in the Middle Ages, and the southerly gaze of Indian Ocean and Chinese mariners of the time.

Third is the consciousness of navigating the roundness of the globe. By the time of the *Itinerario*, coinciding with Drake’s circumnavigation (and fifty years after Magellan and Elcano’s), a European mariner’s imaginary was already spatially global, and as such, required cardinal references to stabilize it. The Occident refers to a particular part of the world that had been geopolitically repartitioned and that constituted the frontier for imperial exploration and trade in competition with other regions of the world.

26 Ricardo Padrón, *The Indies of the Setting Sun: How Early Modern Spain Mapped the Far East as the Transpacific West* (Chicago: University of Chicago Press, 2020).

Fourth is the mariners' consciousness that theoretical and empirical knowledge operate together in the practice of navigation. When the pilot refers to the rhumbs of the compass, he is revealing how the science of cosmography has permeated his imaginary. When he states that the Occident is the area "within the eight quarters from southeast to northeast," he is using technical cosmographical terminology for the purpose of giving stable meaning to a label—a label important to the route and imperial practices which he serves. On the other hand, throughout the *Itinerario*, the pilot emphasizes the role of the senses in helping the mariner fix his location at sea. Thus, the pilot must derive information from *feeling* how the vessel sounds and moves in relation to the waves, currents, winds, and changes in pressure and temperature, and grasp how these and other sensory indications might signal imminent arrival in familiar places or regions.

Fifth, the legacy of cosmological sediments in the spatial imaginary of the mariner should not be overlooked. The use, for example, of terms such as Septentrional, Meridional, Oriental, and Occidental reveals a Greco-Roman heritage, albeit Christianized, that coexists with terms such as North and South (poles), and "the rhumb of *Leste*," betraying the permeation of a Nordic-Germanic cosmology into a contemporary oceanic spatial imaginary. The recourse to these mixed cardinal labels helps reveal the syncretic cultural character of cardinality in this period, a thesis that can be explored further, for example, in cartographical practices of the time.

Sixth, there is an embodied component to the spatial awareness of the mariner. The expression "we imagine a man who stands, with opened arms as in a cross, pointing with the right arm the North Pole, which part we call Septentrional" indicates how the body operates as metaphor for the physicality of space as understood by the mariner. The direction in which the "man" faces discloses a hierarchy of space rooted in the idea of Occident upon which the *Carrera de Indias* route is premised. After all, the man could have faced south, as in analogous instructions from most other contemporary sailing cultures. The adoption of Occident in this case signifies the new imperial spatial frontier, the direction that draws the body facing it. The "cross" element of the statement could be interpreted as well, in line with an observation I have made in relation to my analysis of the lines of Tordesillas and the Tropic of Cancer in the *Carta de Juan de la Cosa*, as a crusading element in an imperial redemption enterprise.²⁷

27 Luis Lobo-Guerrero, "Mapping the Invention of the Early 'Spanish' Empire," in *Mapping, Connectivity, and the Making of European Empires*, ed. Laura Lo Presti, Filipe dos Reis, and Luis Lobo-Guerrero (London: Rowman & Littlefield, 2021), 19–50.

And seventh, perhaps most importantly for the argument made in this chapter, is the problem of relational and referential cardinality in the mariner's spatial imaginary. The statement "this account and repartition, it must be observed, *relates to the horizon of whomever considers it*" indicates the mariner's consciousness of his position in the cardinality problem. Position matters in relation to the horizon considered by the observer, in this case, the situated mariner, who makes decisions with regard to navigation *in situ*. The mariner is cognizant, however, of a referential cardinality relevant to the totality of the enterprise and to the operation of the route and its further development. With his remark at the end of the excerpt ("we shall call Occident, in the discourse of our navigation, the seas and lands located within the eight quarters from southeast to northeast, *with respect to where we are now*"), the pilot makes sure that relational cardinality is not an anarchical spatial strategy. In giving credence and importance to the mariner's own horizon in a given location, he makes the imperial route, stabilized through a referential cardinality, possible.

6.4. Fourth Problem: Cardinality as an Art of Wayfinding

A second example that lends itself to such historical-epistemological analysis is a part of the *Itinerario* where Escalante de Mendoza alerts the reader to the contingent character of cardinality for navigation at sea.

In the following passage, the pilot reacts to the curiosity of his apprentice with regard to the problem of knowing, with relative certainty, one's location at sea, at a time (it bears repeating) prior to the use of longitudes or coordinates as "stable" points of reference for wayfinding and route-making. It relates to the combination of three elements that allow for the governance of a ship towards an intended destination.

Tristán: What certitude is there, sir, that the bearing is sure and certain, and that a ship follows the way pointed by its bow; because it seems to me that in many cases bearings could be wrong due to the bad government of the ship, or an erroneous or badly balanced or insufficiently magnetized needle, or because contrary currents and winds take the ship out of its intended rhumb and bearing.

Pilot: Of three guides, sir, must a mariner at sea make use to certify the way and navigation of a ship.

The first guide is the needle for navigation that always shows the same point with regard to the horizon, and in the same way shows the rhumb

and way towards which to govern the ship, and from which the desired altitude [with respect to the equinox] can be taken.

The second guide is the altitude that is taken of the sun or of the north, from which it can be known, with certainty, how much a man departs from the equatorial line to any of the parts of north or south, and from which it is possible to know if the intended sailing rhumb is correct.

The third is imagination, the fantasy that the good mariner should always employ in relation to knowledge and experience of the ship and all things nautical, tracing and encompassing the route followed by the ship, noting every day in his chart or regiment, comparing it with the altitude, direction, and rhumb through which it sails;

[...] and thus, nobody should sail without using these three guides: direction, altitude, and fantasy, since a bearing will be certain when all three concur, almost jointly, or at least those of direction and altitude; because fantasy serves as instrument so that no notable error is made, and altitude and direction serve as sufficient proof for the man to certify if the trace and fantasy of its understanding is true or false.²⁸

When reading the passage above in relation to the analysis offered of the previous excerpt, it might appear, at first, a contradiction to say that the mariner could exercise discretionary judgment when ascertaining his position at sea. When the pilot states that the “first guide is the needle for navigation that always shows a same point with regard to the horizon, and in the same way shows the rhumb and way towards which to govern the ship, and from which the desired altitude [with respect to the equinox] can be taken,” he is claiming that there is a stable point of reference for confirming direction (magnetic north), and a stable parallel line at the equinox from which to determine latitude. This he offers as a matter of fact, a fact that relies on an instrument (the compass) for establishing a continuous reference; instruments for finding the latitude of the vessel (the marine astrolabe and the cross-staff); and the instrument of the mariner's expertise. In other parts of the text he mentions how the compass should be prepared, maintained, and calibrated, indicating how the functionality of such instruments is the result of the agency of the mariner and the expert, rather than inherent in the tool. In sections devoted to the practice of finding latitude, either by reference to the sun or to the North Star, he takes pains to alert his interlocutor to the role the mariner plays in using the instrument,

²⁸ Escalante de Mendoza, *Itinerario de Navegacion de Los Mares y Tierras Occidentales* 1575, 204.

and how an erroneous interpretation of the observation could lead to false certainties. Where is there room for the discretion of the mariner if, in principle, what was needed to reach a destination was simply proper use of instruments and following a course until the desired latitude was reached?

The idea of contingency relates to how certain events or conditions are not always necessary or indispensable for something to be possible. It involves the consideration that there is leeway for discretion to do things differently (for example, variously interpreting results obtained from instruments designed to provide information about a particular phenomenon). It follows that the idea of contingency casts a given actor as a deciding subject, who exercises discretion at certain moments. The importance of contingency, when reflecting on cardinality, is that it showcases the awareness and agency of navigators in their activities. The sixteenth-century mariner is not merely a subject of power, or of cosmographical knowledge, but is an agent, who interprets specific contexts, makes decisions, creates opportunities, and employs resources in creative ways when needed.

A key to comprehending the contingent agency of the mariner when ascertaining location is the pilot's third guide, that of imagination. For Escalante, imagination refers to the complex set of knowledge, experience, and discretion the mariner draws on when employing cardinality aboard. Imagination is not understood as dismissive of reality, but quite the opposite. Perhaps the best way to appreciate what he refers to here is by comparison to the present-day notion of "the imaginary."²⁹ An imaginary is not imagined ideas, but an empirical/intellectual space where the real is constituted and can be understood and interrogated. To give an example, an imaginary of sailing is not simply the result of the logical implementation of maneuvers in relation to navigational information and techniques. It involves these components, of course, but in careful interaction with, and reaction to, sensory data obtained from natural phenomena (such as winds, currents, waves, climate, and fauna), as well as awareness of economic, political, environmental, and social conditions that would make routes navigable, or not, at given times. It also incorporates the cosmology of the mariner, his belief systems and fears, his schooling and socialization, and the cultural context at hand. The training of the mariner, and his experience at sea, together with his discretion in acquiring and interpreting sensory information (remote or situated), become part of the imaginary of navigation. Assumed as such, an imaginary of navigation places the mariner as the central actor of the

29 Cf. Luis Lobo-Guerrero, Suvi Alt, and Maarten Meijer, eds., *Imaginaries of Connectivity: The Creation of Novel Spaces of Governance* (London: Rowman & Littlefield, 2019).

practice of sailing, an actor who is far from stable and predictable, and is highly adaptable to changing and emerging circumstances.

It is possible then to observe that when deciding on the right course to follow aboard a ship, a pilot employs relational cardinality as expressed in the quote above. To follow a route, however, is not a matter of merely following a fixed direction. It is instead the complex result of a relation between the mariner and his imaginary, the context (which was greatly influenced by natural elements), and the intended objective (to head towards a particular location). A mariner would have to react to shifting weather conditions and unpredictable situations, including the morale of the crew and the capacity to maintain navigability of the vessel, through mutable circumstances. Such an imaginary relates as much to acquired knowledge as to decisions made *in situ* based on the acumen of experience and specific contexts.

Conclusion: Referential Cardinality as Navigation

By now, two dimensions of cardinality have been shown to be at play in the work of Escalante de Mendoza. On the one hand, there is a cosmographical facet, which employs cardinal points as geographical references for wayfinding across the globe. This, as noted, has cosmological grounds. By the sixteenth century, Europeans relied on north, south, east, and west to constitute a grid of intelligibility that allowed for identifying sites on a global terrestrial space. With the inscription of a wind rose on any part of a visual representation (for example, on a sea chart), space is divided into rhumbs that indicate directions to be followed to reach destinations. However, the stability of such a grid of intelligibility was found to be affected by a phenomenon still poorly understood at the time: magnetic declination. Finding ways to account for the difference between the true north and magnetic north forced the mariner to use cardinal points as references, but not as absolute markers, for directionality.

On the other hand, mariners knew all along that what mattered for them was not what charts could show, with their problems of scale, projection, and accuracy, but what they experienced of their location. For them, the main interest was in knowing where they were in relation to their origin and destination. This seemingly banal concern required an advanced capacity for wayfinding that relied in part on instruments, but mostly, on the mariners' capacity to employ them, interpret the information they gathered from them, and combine such data with their situated expertise and experience at sea. Referential cardinality is connected with the capacity of the mariner to

bring all this to bear when wayfinding, permitting the recording (logging) of a trajectory in a systematic way.

Throughout the *Itinerario*, Escalante de Mendoza traces a constant negotiation of spatial empirical experience (acquired through apprenticing, training, studying, and long years of problem-solving at sea) with the higher-order theoretical reflections on space that came with cosmographical knowledge. Obedient to the teachings of the ancient geographers, and cognizant of the latest knowledge in relation to the use of instruments for establishing altitude, Escalante de Mendoza instructs his readers in the art of combining both, in a way that supports the operation of a commercial route of vital importance to the crown he served. In this way, he retains the pragmatism of cardinality for navigation, integrating the commercial, political, economic, cultural, and even religious dimensions of the enterprise, while reminding the reader of the presential character of the mariner in the sailing experience. In today's terms, this could be referred to as theoretically informed situated knowledge at the service of a state-centralized commercial venture in a context of an inter-imperial European competition (which some label mercantilism).

It should be noted that Escalante de Mendoza was not the first to make this observation in the intellectual context under which it developed. Already in 1545, Pedro de Medina (1493–1567) alluded to this phenomenon when mentioning *sutileza* (subtlety) as one of the three virtues of navigation.³⁰ For him, *sutileza* meant deftness in making small decisions; adapting to circumstances; employing knowledge and expertise; and being able to create opportunities when needed. What our author does is to explore this virtue in a pedagogical form that might allow an apprentice to acquire a foundation in the art of navigation. And art, it must be stated, is what navigation was all about.

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30 Pedro de Medina, *Arte de navegar* (Valladolid: Casa de Francisco Fernández de Cordova, 1545), Prohemio.

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and Maarten Meijer) (Rowman & Littlefield, 2019), *Mapping, Connectivity and the Making of European Empires* (ed. with Laura Lo Presti and Filipe dos Reis) (Rowman & Littlefield, 2021), and *Navigation and Connectivity* (with Inanna Hamati-Atay and Nicolas Gäckle) (Rowman & Littlefield, forthcoming 2026).

7. Precious Art or Tried and Tested Science: Early Modern Indian Ocean Navigation in Context

Juan Acevedo

Abstract: Classical nautical Arabic literature, particularly the works of Aḥmad ibn Mājid and Sulaymān al-Mahrī from the late fifteenth and early sixteenth centuries, serves as a crucial example of early modern technical literature. This *Fachliteratur* was taught discreetly to select initiates. Their writings encompass various terms related to their subject, such as *ʿilm* (knowledge), *tajribah* (experimentation), and *ikhtirāʿ* (invention), which highlight the practical and theoretical aspects of astronavigation. I compare these terms with contemporary early modern European sources, where discussions around *scientia*, *experientia*, and *ars* contributed to the evolution of modern science. This comparative analysis of non-European texts broadens the discourse, enriching it and challenging the Eurocentric perspective on the origins of modern scientific thought.

Keywords: scientific revolution, arabic nautical corpus, history of ideas, craft transmission, cosmology, Indian Ocean.

Introduction

This chapter has to do, fundamentally, with an age-old question of classical philosophical pedigree: the relation between practical and theoretical knowledge. This means it has to do with epistemology, including the classification of knowledge. But I shall treat my subject through topical examples from the history of early modern science, to enrich

the fundamental discussion from a very specific and tangential field of action. I could say with the same justification that this chapter is about early modern Arabic navigation and about the definition and role of theoretical and practical knowledge in it. The following pages, then, have to do with particular instances of Indian Ocean navigation practices in the sixteenth century. They will be prefaced and concluded with some notes on the fundamental issues mentioned above, which will run through the chapter *sotto voce* as I present my nautical evidence. Additionally, by comparing this with contemporaneous early modern developments in Europe and by highlighting certain commonalities, I suggest ways in which the narratives of the early modern origins of Western science may be further nuanced, allowing for the sophistication of practices like those of the Indian Ocean navigators.

It can be safely said that our age-old question, the theory–practice question, goes back *substantially* to what is portrayed in Plato’s *Timaeus* as the indetermination of the demiurge. This divine creative intelligence, who is a mathematician and an architect and who fashions and “implements” the universe, straddling metaphysical principles and physical determinations, gave rise to echoes and elaborations, both in the Platonic and Aristotelian traditions, which would inform and determine countless discussions throughout the Middle Ages.¹ For as long as epistemology was considered in its essential relations to metaphysics, theology, or mythology, depending on the more or less symbolic languages of different cultures, our question had a universal import. It is sufficient to think of the Hindu figure of Vishvakarman, Builder of the Universe, with the associated Vedic exegesis on caste activities and the status of art,² or the biblical figures of Bezalel and Solomon, masters of the *logos*, of the crafts and architecture.³ As a universal and timeless question, then, it is best and most appropriately studied within historiographical frameworks which respect the variety and depth of pre-modern cosmologies; or we could also say, which take into account the relevant cultural contexts. To do justice to basic questions

1 In-depth discussion, historical and bibliographic references are given in Luc Brisson, *Le même et l'autre dans la structure ontologique du Timée de Platon: un commentaire systématique du Timée de Platon*, 3rd ed., International Plato Studies 2 (Sankt Augustin: Academia Verlag, 1998), 27–106, 538.

2 See Stella Kramrisch, “Traditions of the Indian Craftsman,” *The Journal of American Folklore* 71, no. 281 (September 1958): 224–225.

3 For these two characters in their relations to cosmogony and cosmology, see Juan Acevedo, *Alphanumeric Cosmology from Greek into Arabic* (Tübingen: Mohr Siebeck, 2020), 105–106, 166–167, <https://doi.org/10.1628/978-3-16-159246-1>.

in the history of science, it might be ventured, the same kind of shift is needed as that advocated by Aby Warburg and his associates in the field of the history of art: “to see the image as being indissolubly bound up with culture as a whole.”⁴ We could put it even more succinctly and say that the history of science is called by its own subjects of study to be a history of ideas and a “science of culture,” *Begriffsgeschichte* and *Kulturwissenschaft*, to use the established German terms. In particular, the semantic traps of our narrowed-down contemporary words “art” and “science”⁵ are to be avoided.

Fortunately, this is the kind of scholarship that has been coming from many directions over the last decades, addressing and redressing previous perspectives, arguing cogently for an understanding of “science” that can do justice to the historical realities of earlier times and other cultures, an “enriched perspective” “reinventing the discipline,”⁶ exploring the “situatedness of science.”⁷

This chapter aims to offer a contribution in this direction, not only by reaching geographically into Indian Ocean sources written in Arabic, but also by drawing awareness to the religious, or more properly cosmological, aspect which often needs to be fully accounted for in the historiography of science. This latter concern does not derive from any programmatic interest, but is rather borne out again and again by the sources, and is thus a *sine qua non* for a proper understanding of premodern “science.” My Arabic sources, in particular, exhibit the cosmological awareness which is common to scientific works produced within the Abrahamic worldview. Let us now turn to them.

4 Michael Diers, Thomas Girst, and Dorothea von Moltke, “Warburg and the Warburgian Tradition of Cultural History,” *New German Critique* 65 (1995): 69, <https://doi.org/10.2307/488533>.

5 Traps masterfully analyzed and illustrated in Anna Wierzbicka, “Defining ‘the Humanities,’” *Culture & Psychology* 17, no. 1 (March 2011): 40–44, <https://doi.org/10.1177/1354067X10388841>, and Anna Wierzbicka, *Experience, Evidence, and Sense: The Hidden Cultural Legacy of English* (Oxford: Oxford University Press, 2010) especially 6–34 on empiricism and experience. See also, more recently, Philipp Roelli, *Latin as the Language of Science and Learning* (Berlin: De Gruyter, 2021), 23–26, <https://doi.org/10.1515/9783110745832>.

6 See in general, Katharine Park and Lorraine Daston, eds., *The Cambridge History of Science*, 1st ed. (Cambridge: Cambridge University Press, 2006), <https://doi.org/10.1017/CHOL9780521572446>. See also Arun Bala et al., eds., *The Bright Dark Ages: Comparative and Connective Perspectives* (Leiden: Brill, 2016), <https://brill.com/view/title/24942>.

7 Hugh Richard Slotten, “Introduction,” in *The Cambridge History of Science*, Vol. 8: *Modern Science in National, Transnational, and Global Context*, ed. Hugh Richard Slotten, Ronald L. Numbers, and David N. Livingstone, 1st ed. (Cambridge: Cambridge University Press, 2020), 1, <https://doi.org/10.1017/9781139044301.002>.

7.1. The Corpus and the Pilots

The received extant corpus of Arabic nautical literature—stretching into the nineteenth century, when a new generation of texts begins to appear—consists of the works of Aḥmad ibn Mājid and of Sulaymān al-Mahrī, who hail from the southern Arabian Peninsula and flourished in the late fifteenth and early sixteenth centuries respectively. This corpus, preserved in manuscripts in libraries around the world, and amounting roughly to more than a thousand pages of modern printed editions,⁸ has an unparalleled historical importance for both intrinsic and extrinsic reasons. It is of intrinsic value because it contains a wealth of extremely varied historical, literary, scientific, and technical information. It is extrinsically important, first, because it was produced around the time of the first arrivals of the Portuguese expeditionary forces, which would come to alter dramatically the dynamics of the region; and second, because it greatly influenced later nautical works, notably in Turkish⁹ and some Indian languages,¹⁰ some later Arabic works, and most likely European languages benefitting from local knowledge.¹¹

Most of the works by Ibn Mājid (ca. 1420–end of fifteenth century) are technical instructional poems, with the outstanding exception of his *Fawā'id fī uṣūl 'ilm al-baḥr wa-al-qawā'id* (hereafter *Fawā'id*; “Commentaries on the Principles and Foundations of Maritime Science”), a long, encyclopedic, at times highly specialized and at times disarmingly varied work composed in his old age. The *Fawā'id* is the only complete work of this corpus to have been made widely available in translation in a Western language, through Gerald Tibbetts’s 1981 publication.¹² In Ibn Mājid’s own view, though, it is the (*Al-*

8 Critical editions of most works were produced by Ibrahim Khoury in Damascus in the early 1970s, as part of a four-volume series, *Al-‘Ulūm al-baḥrīya ‘inda al-‘Arab* [Maritime Sciences among the Arabs]. These have been supplemented more recently with publications by Ḥasan Ṣāliḥ Shihāb. For comprehensive details, including manuscript sources, see Juan Acevedo, Inês Bénard, and Julianne Müller, *Indian Ocean Arab Navigation Studies Towards a Global Perspective: Annotated Bibliography and Research Roadmap*, v. 5.1, vol. 2, RUTTER Technical Notes (Lisbon: ERC RUTTER Project, 2023).

9 Namely the 1554 *El-Muḥīt fī ‘ilm el-eflak ve’l-ebhur* (“Book of the Ocean on the Science of the Spheres and the Seas”) of Sidi Ali Reis (Çelebi); for details see the above-cited Technical Note by Acevedo and Bénard.

10 Cf. in Malayalam, Lotika Varadarajan, *The Rahmani of M. P. Kunhikunhi Malmi of Karavatti: A Sailing Manual of Lakshadweep* (New Delhi: Manohar, 2004).

11 See chapter 8 of this volume, where Inês Bénard discusses the relation with Portuguese nautical sources in particular.

12 G. R. Tibbetts, *Arab Navigation in the Indian Ocean before the Coming of the Portuguese* (London: Royal Asiatic Society of Great Britain and Ireland, 1981; Routledge, 2004), enriched with

Ḥāwīyat al-ikhtiṣār fī uṣūl ‘ilm al-biḥār (hereafter *Ḥāwīyah*; “Comprehensive Summary on the Principles of the Knowledge of the Seas”) which counted as his most important didactic poem.¹³

Sulaymān al-Mahrī (ca. 1480–1550) is a more restrained and strictly technical author, treating topics which mostly overlap with and develop those of Ibn Mājid. His most important work is *Al-‘Umdah al-mahrīyah fī ḍabṭ al-‘ulūm al-baḥrīyah* (hereafter *‘Umdah*; “The Reliable Mahrī Treatise on the Exactitude of Maritime Sciences”). Interestingly, al-Mahrī exhibits an astronomical bent which is absent from Ibn Mājid, is unusual for nautical literature, and which brings him remarkably close to the Arabic scholarly astronomical tradition.¹⁴

These two authors consider themselves to be the heirs of a centuries-old tradition of maritime knowledge, a tradition of which we only have anecdotal traces in travel literature. They give detailed instructions on nautical astronomy and stellar navigation, using the lunar stations in sophisticated chronometric and positional ways. They elaborate on the use of stellar rhumbs to plot routes which cover an area from Jeddah in the Red Sea south to Madagascar, and all along the Yemeni and Persian Gulf coasts, then down the Malabar Coast, beyond this to the Bay of Bengal and east to Malacca and Java; they give seamarks, including topography and depth measures, of many routes, and anchorages on all these regions.¹⁵ Additionally they treat of dangers at sea and on board, and, more significantly for us here, they discuss the virtues and qualities of pilots or navigators (I use these two terms rather interchangeably throughout).

The navigators described in these works are almost without exception called *ma‘ālimah*, “those who teach,” plural of *mu‘allim*, which is a common denomination for an instructor of any discipline. Arabic, like other Semitic languages, has great etymological transparency on account of its reliance on lexical triliteral roots. In this case, the *mu‘allim* is etymologically a provider of *‘ilm*, meaning “knowledge,” from the same root *‘-l-m*. Let us look further into this knowledge which characterizes the navigator, and into

valuable notes and appendices. I am currently working on a new critical edition and translation of the *Fawā'id*, taking into account the earliest manuscripts.

13 For detailed information about all the works mentioned in this paragraph, see Acevedo, Bénard and Müller, *Indian Ocean Arab Navigation Studies*.

14 See Eric Staples, Juan Acevedo and Inês Bénard, “Al-Mahrī’s *Mir’āt al-salāk li-kurāt al-aflāk*: A 16th-Century Yemeni Navigator’s Reflections on Astronomical Knowledge,” *Nouvelles chroniques du manuscrit au Yémen* 16 (35) (January 2023): 96–120.

15 An excellent introduction to the details of all these practices is William Facey and Anthony R. Constable, eds., *The Principles of Arab Navigation* (London: Arabian Publishing, 2013).

other associated Arabic terms, and let us compare them with the words used in the European tradition, so as to allow the semantic divergences and coincidences to reveal more fully the concept we are tracking: what was this knowledge of the Arab pilots? Was it a high and lofty and theoretical science, or a mechanical, lowly servile technique? Was it functional or significant, utilitarian or spiritual? Was it monolithic?

7.2. Facets of Knowledge

I shall now present and comment on various occurrences of knowledge-related concepts in the Arabic nautical corpus. They will serve to illustrate the underlying semantic complexity, and thus give us room for elaboration and comparison. Most are taken from the *Fawā'id*, as the representative of the genre par excellence, but I also include examples from other sources.

I must preface the sampling by observing how the very titles of Arabic works pertaining to nautical sciences are already indicative of an established conceptual field: the main works of Ibn Mājid and of al-Mahrī are expressly dedicated to *'ilm al-baḥr* and *'ilm al-biḥār*, the “science” or “knowledge” of the sea or the seas. The translation of the word *'ilm* (pl. *'ulūm*) alone has been the object of intricate arguments for centuries, and its semantic range has been the object of monographs through the centuries.¹⁶ As pointed out by Akkach, its fundamental importance in Islamic civilization springs from the pages of the Qur'ān, and it is confirmed for the Muslim community by the Prophetic sunnah (the “exemplary way”) which determines daily life. A suitable way to explain its range of meanings may be to compare it to the medieval Latin *scientia*, i.e., a term which could equally refer to metaphysical doctrinal knowledge, or to the tenets of “natural philosophy,” including concerns that would nowadays belong to engineering, physics, and other disciplines. Similarly, at different stages of development of the Latin language, we would find that the meanings of *ars* aligned with those of Arabic *'ilm*, as in the important early tradition of the seven *artes liberales*.

So, in the context of navigation, apart from the name of the maritime “science” itself, and as mentioned above, the most common way of

¹⁶ Two of the most important recent works on this topic are Franz Rosenthal, *Knowledge Triumphant: The Concept of Knowledge in Medieval Islam*, Brill Classics in Islam 2 (Boston: Brill, 2007); Samer Akkach, ed., *'Ilm: Science, Religion and Art in Islam* (Adelaide: University of Adelaide Press, 2019).

addressing the Indian Ocean navigators is a cognate of *‘ilm*. In his useful *Mu‘jam al-fāz al-mustaḥāt al-milāḥīyah* (“Glossary of Nautical Terminology”), Ibrahim Khoury introduces another common term as he gives the following definition: “*Mu‘allim*: the captain (*rubbān*) of a ship; there is no clearcut difference between *mu‘allim* and *rubbān*. Each one of them directs the ship, and each one knows about orientation (*hidāyah*) by the stars, landmarks, and by everything else which is necessary for the art (*fann*) of navigation.”¹⁷ Before dwelling on this definition, let us look at how this knowledge of the pilots is nuanced and complemented in several passages of our Arabic texts.

Ibn Mājid’s two major works, his *Fawā'id* and his *Ḥāwīyah*, begin with paeans to knowledge in general, and throughout they extol, in very self-aware style, the value of the knowledge they impart and the need for the guidance of a respected master. *Ṭalab al-‘ilm*, the pursuit of knowledge, is the explicit prerequisite of the aspiring navigator, who is often addressed as *ṭālib al-‘ilm*, the seeker of knowledge.¹⁸ In fact, right from the outset, there is a clear continuity between religious and practical knowledge: in the *Fawā'id* there is mention of the importance of nautical knowledge in its relation to the finding of the *qibla*, the orientation of canonical prayer, whereas in the *Ḥāwīyah* there is mention of the inspiration (*ilhām*) received by the author in order to master and communicate his science in the most worthy manner, followed by the opening lines,

Oh you who seek after the science of the sea [...], if you are one of those who strive for the sciences (*‘ulūm*), and remembers his teacher every day, you need seamanship books (*rahmānījāt*) [...], with the condition that you do not read them without a teacher, for there are hints in them which the ignorant will consider to be weaknesses.¹⁹

This kind of introduction makes clear the dependence on a dual transmission of knowledge: one vertical, as the navigators receive their inspiration from above, requesting from God the same orientation (*hidāyah*) that they provide

17 Ibrahim Khoury, *Al-‘Ulūm al-Baḥrīyah ‘inda al-‘Arab* 1.3 (Damascus: Arab Academy of Damascus, 1972), 690–884.

18 On the central role of this concept in the Islamic worldview and its codification in the sacred law, see Mohammad Hashim Kamali, *Citizenship and Accountability of Government: An Islamic Perspective*, Fundamental Rights and Liberties in Islam (Cambridge: Islamic Texts Society, 2011), 48–51.

19 Aḥmad Ibn Mājid, “La Hawiya: abregé versifié des principes de nautique,” ed. Ibrahim Khoury, *Bulletin d’études orientales* 24 (1971): 249–386, verses 6–11.



Figure 7.1. In this celestial compass rose from a later manuscript in the same nautical tradition, we can see the Kaaba at the center of the thirty-two rhumbs associated with asterisms. It is the image of the qibla as central to orientation in space (Biblioteca nacional de Portugal, Or. 2, fol.1r)

through their work. And one horizontal, as they receive texts and cultivate reverence for their lineage, a relation that practically “unlocks” the texts for them, texts which might otherwise remain poorly understood, or simply impracticable. This regard for the predecessors is actually stressed repeatedly by Ibn Mājid in several works, when he mentions three famous pilots by name, and calls himself, both proudly and humbly, “the fourth of three.”²⁰

The characterization is expanded a little in the *Fawā'id*, and new key terms are introduced:

20 See especially Shihāb al-Dīn Aḥmad Ibn Mājid, *Kitāb al-fawā'id fī uṣūl 'ilm al-baḥr wa-al-qawā'id*, ed. Ibrahim Khoury and 'Izzat Ḥasan, *Al-'ulūm al-baḥrīyah 'inda al-'arab*, 2,1 (Damascus, 1971), 14–15.

A man may decide to act without the practical knowledge (*maʿrifah*) and the understanding (*ḥisāb*) of the sea, but whenever he lacks the *qibla* directions of towns and islands which are in the Encircling Ocean, then he must use this knowledge (*ʿilm*) of ours. So let him strive so, for it is a precious knowledge (*ʿilm nafīs*) whose perfectioning takes a lifetime.²¹

Apart from the reminder about the relation with the *qibla* direction, there is the reference to prolonged practice: this is not a knowledge that can be gained overnight, but the fruit of a life-long effort.

Another term, *maʿrifah*, is crucial in *Fachliteratur* in general, for though often conflated in translation with *ʿilm*, and though broad in philosophical and even mystical connotations, in our context it means the actual acquaintance with a situation, a procedure, a set of parameters; chapter sections in al-Mahrī are often dedicated to the *maʿrifah* of this or that particular point of experience,²² to a particular know-how. This is why I have chosen to translate it here as “practical knowledge.” In this particular case, the word *ḥisāb* is given as the theoretical complement of *maʿrifah*, for it has to do with calculation and reckoning (“arithmetic” is in fact one of its usual meanings), and it always includes the idea of mental activity.

The opening lines of al-Mahrī’s *ʿUmdah* give fascinating insights into the theory–practice relation. The author explains how his book intends to be

concise (*dābit*) about its questions on principles and applications [...], based on constantly repeated experience (*tajribah al-mutawātirah*) which is either my own or has been received from veracious trusted sources; with a concern for accuracy (*ṣiḥḥah*) which links the principle to the accepted way of measuring (*qānūn al-tadrīj*) in the practical applications.²³

“Constantly repeated” attempts to convey the strong meaning of *mutawātir*, which has to do with continuity in time and thus following on the idea of

21 Ibn Mājid, *Kitāb al-fawā'id*, 5. Page numbers refer to Khoury’s critical edition; when a folio number is given, it refers to the Bodleian MS Selden Superius 46, which I am currently studying. Translations are mine unless otherwise stated.

22 See Inès Bénard and Juan Acevedo, *Conspectus of Works of Sulayman al-Mahrī (Muḥtawiyāt muʿallafāt Sulaymān al-Mahrī)*. Vol. 13. RUTTER Technical Notes. Lisbon: ERC RUTTER Project, 2024.

23 Sulaymān al-Mahrī, *al-ʿUmdah al-mahrīyah fī dābṭ al-ʿulūm al-baḥrīyah*, ed. Ibrahim Khoury, *Al-ʿulūm al-baḥrīyah ʿinda al-ʿarab*, 1,1 (Damascus, 1971), 3–4.

a lifetime practice, and also with the controlled repetition expressed, for example, in Galileo as *esperienze ben cento volte replicate*, “trials repeated a full hundred times.”²⁴ Here al-Mahrī specifies that it is not just one lifetime, but that it can include the experiences of reliable authorities. We will see more about *tajribah*, “experience,” below. The overall impression seems very closely to echo Vitruvius’s characterization of *fabrica*, “craft” (the empirical complement of *ratiocinatio*, “reasoning”) as *continuata ac trita usus meditatio*, “the uninterrupted and stubborn concern over a specific practice.”²⁵

As for the last sentence in the citation, which is not easy to parse, my interpretation is the following: there are in this maritime technoscience, as in every other similar discipline, theoretical principles and practical applications. The latter require and depend on established sets, the “accepted ways” or “canons,” of conventional “measures” or other analytical systems. And what ensures that there is a connection with the abstract principles is a keen attention to accuracy, the painstaking concern for detail, or to put it in contemporary terms, the fastidious implementation of rules and standard procedures. These fundamental concerns and attention to a basic existing “principle” bring to mind early modern European reflections on the relation between *scientia*, *ars*, and *experientia*, by artisans who “believed they possessed a species of knowledge, based on nature and extracted through bodily work, which was as certain as any demonstrative proof.”²⁶

Ibn Mājid chimes in as follows, combining the two notions of accuracy and experience:

In our own times, nothing has been added which is as sound as our teachings (*‘ulūm*), our experiences (*tajārib*), and our discoveries (*ikhtirā’āt*), as recorded in this book. For everything here has been confirmed by experience (*muṣaḥḥaḥah mujarrabah*), and there is nothing superior to experience (*tajrib*). “The end point of the precursors is the starting point of the successors”;²⁷ therefore we have expanded their knowledge and

24 See Peter Dear, “The Meanings of Experience,” in *The Cambridge History of Science*, Vol. 3: *Early Modern Science*, ed. Katharine Park and Lorraine Daston (Cambridge: Cambridge University Press, 2006), 123, <https://doi.org/10.1017/CHOL9780521572446.005>.

25 Vitruvius, *Zehn Bücher Über Architektur / De Architectura*, ed. Curt Fensterbusch, Bibliothek Klassischer Texte (Darmstadt: Wissenschaftliche Buchgesellschaft, 1991), 1,1, 22.

26 Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago: University of Chicago Press, 2004), 87–93, gives and analyzes examples taken from Leonardo, Dürer, and Paracelsus.

27 *Nihāyat al-mutaqaddim bidāyat al-muta’akhir*; this was a well-known principle in jurisprudence literature (*fiqh*).

their works, and have paid tribute to them [...] and perhaps occasionally, among the knowledge of the sea which we have discovered, one of the pages of our works might improve on them as regards wording, usefulness, guidance, and orientation.²⁸

The root of *ṣiḥḥah* above is the same as that of *muṣaḥḥaḥah* here, and it carries notions of detailed verification, hence controlled accuracy and confirmation. But what is more remarkable in this excerpt is how the primacy of the value of experience is smoothly integrated within the tribute to the forebears. The phrase “nothing superior to experience” echoes almost verbatim the words employed by the very near contemporaneous Leonardo da Vinci, “l’esperientia, madre d’ogni certezza.”²⁹ Later on, along similar lines:

Take for yourself what has been subject to correction (*muḥadhdhab*) and experience, and act upon it, for experience (*tajribah*) means everything in this art (*fann*).³⁰

Once again we find the word *fann*, “art,” which is used interchangeably with *ilm* because it is also used in the sense of Latin *ars*, as in the seven *artes liberales*, comprising a “scientific” dimension which does not quite resonate with our contemporary notion of art. I have little doubt that the most appropriate English translation available nowadays would be “technoscience.”³¹ In the same tenor, here is another little addition to the mix:

I have not mentioned anything so ambiguous that its biggest and lowest values vary by approximately two *zām*.³² Out of this arises its validity (*ṣiḥḥah*), for this knowledge is rational-experiential (*‘aqlī tajribī*), not based on convention (*naqlī*).³³

28 Ibn Mājid, *Kitāb al-fawā'id*, 16–17.

29 Leonardo’s “Paragone,” cited in Monica Azzolini, “In Praise of Art: Text and Context of Leonardo’s ‘Paragone’ and Its Critique of the Arts and Sciences,” *Renaissance Studies* 19, no. 4 (2005): 502.

30 Ibn Mājid, *Kitāb al-fawā'id*, 203.

31 See Pamela H Smith, “Science on the Move: Recent Trends in the History of Early Modern Science,” *Renaissance Quarterly* 62, no. 2 (2009): 358, <https://doi.org/10.1086/599864>.

32 In this literature, a *zām* is the customary unit of time, and therefore of distance sailed, approximately 12 nautical miles. For this and other technical terms, see Eric Staples and Abdulrahman Al Salimi, *A Maritime Lexicon: Arabic Nautical Terminology in the Indian Ocean* (Hildesheim: Georg Olms, 2019), 418.

33 Ibn Mājid, *Kitāb al-fawā'id*, 22.

There is an apparent disagreement here with the respect for the predecessors, while recognizing the primacy of verification by experience, something further developed later:

We have mentioned in this book the sum of useful matters which are of interest to reflective experts (*al-ʿārifūn al-mutaʿammilūn*) [...] And since ‘tested sound knowledge (*ḥikmah*) is the stray property of the believer,³⁴ seek your lost property! Even if it be among impious people, for this craft (*ṣanʿah*) is by reason, not by convention.³⁵

The famous prophetic tradition cited is often tritely rendered as “wisdom is the stray property of the believer,” but in this context, and in general in the corpus at hand, words related to the root of *ḥikmah* have to do with tested, *pondered* knowledge. In this usage of “wisdom”, as in the “reflective experts” and the “rational-experiential” label, we can hear echoes, yet again, of the Vitruvian *usus meditatio* mentioned above, the “concern over a specific practice,” the proper and artisanal earnest “minding one’s business.” To suggest a contemporaneous European parallel once again, we seem to be very close, and not just in time, to the *nova scientia* (preferably translated as “New Knowledge”) of Niccolò Tartaglia (1499–1557), published in 1537, which “prioritized practical experience, measurement, instrumentation, geometrical theorems, and predictable outcomes.”³⁶

The use of *ṣanʿah*, “art,” introduced as a synonym of *fann*, has in addition the connotation of a technique, of a set of skills and of the making of something, and it carries an implicit question: if navigation is an art in this “productive,” “poietic” sense, what is its product? If a sculptor makes sculptures and a pizzaiolo makes pizza, what does a navigator make? Our tentative answer is: the routes, the established paths like highways across the ocean, which allow for regular travel back and forth.³⁷

34 Part of a well-known hadith, *Jāmiʿ al-Tirmidhī*, 2687.

35 Ibn Mājid, *Kitāb al-fawāʿid*, 338, fol. 110r–110v.

36 Jim Bennett, “The Mechanical Arts,” in *The Cambridge History of Science*, Vol. 3: *Early Modern Science*, ed. Katharine Park and Lorraine Daston (Cambridge: Cambridge University Press, 2006), 692, <https://doi.org/10.1017/CHOL9780521572446.028>.

37 Cf. in this volume, José María Moreno Madrid’s chapter 3, “Monitoring the Paths of the Sea: Rutters, Laws, and Long-Distance Control in Sixteenth-Century Iberian Empires.”

7.3. Social Context

This last remark brings me to an observation from outside the text of the Arabic corpus which will allow me to start wrapping up my argument, and which has to do with the social context of navigation. It has to do more generally, with the *political* context of technoscientific developments, with the European early modern “empirical revolution in the world of knowledge,” seen as “intimately linked to the construction of global empires,”³⁸ and with Brendecke’s “politics of knowledge” or rather “functions of knowledge.”³⁹ My observation, constantly made over the course of recent research into the sources, is the difference in context between these early modern Arab pilots and their Iberian counterparts. There is never in the Arabic corpus the slightest mention of an official institution, not of even a royal authority, that has any direct relation with the production of the works—it is all, as it were, knowledge for knowledge’s sake, pure *Fachliteratur*, unencumbered by patronage, officialdom, or any regulations.

As we consider the narrative that modern science, that vaunted “revolution,” may have been driven and shaped by an imperial framework, it will be of profit to ponder on these Arab pilots. The reader will have observed by now what a “modern” scientific approach theirs was, how they combined a respect for their heritage with an uncompromising attachment to verifiable, repeated experience. I have already tried to bring out this kinship in my mentions of European parallels while introducing my Arabic nautical evidence. Observing the differences between these two parallel lines of maritime technoscientific knowledge—especially because they were so fatefully tied after the 1498 arrival of Da Gama in Asian waters—may now help us refine and complete the picture being drawn by scholars such as Harris⁴⁰ and Brendecke. When Harris speaks of the crucial role of “the activities of long-distance corporations,” like Seville’s Casa de la Contratación or Lisbon’s Armazéns de Guiné, and when Brendecke says that “some

38 See Antonio Sánchez, “Practical Knowledge and Empire in the Early Modern Iberian World: Towards an Artisanal Turn,” *Centaureus* 61, no. 3 (2019): 278, <https://doi.org/10.1111/1600-0498.12217>.

39 I find the first expression slightly too narrow in scope, while the second is actually a more direct rendering of the original German and is used in the revised Spanish edition, Arndt Brendecke, *Imperio e información. Funciones del saber en el dominio colonial español*, trans. Griselda Mársico, 2nd, rev. and expanded ed. Tiempo emulado. Historia de América y España 25 (Madrid: Iberoamericana, 2016).

40 Particularly Steven Harris, “Networks of Travel, Correspondence, and Exchange,” in *The Cambridge History of Science*, Vol. 3: *Early Modern Science*, ed. Katharine Park and Lorraine Daston (Cambridge: Cambridge University Press, 2006), 341–62, <https://doi.org/10.1017/CHOL9780521572446.017>.

significant elements of the culture of modern empirical knowledge can only be understood when put in relation to the practices of dominion and administration,⁴¹ perhaps we should indeed let the emphasis strongly be on this administrative, bureaucratic, aspect of empire, in its regulating impact. It is precisely this “managerial” aspect which is so clearly revealed, almost innocently, by Linnaean taxonomy, “a form of biopolitics, what we might call ‘imperial biopower,’ devoted to turning diversity, local variation, and qualia into data”;⁴² in its ledger-like organization, it functioned as “a technoscope that depends on empire and at the same time underpins it.”⁴³

Ibn Mājīd and al-Mahrī were to some extent itinerant craftsmen, quite in the spirit of the medieval European guilds; they enjoyed their “academic” freedom, and were devoted to teaching. Their Iberian counterparts, navigators of renown like Bartolomeu Dias (ca. 1450–1500), who first rounded the Cape of Good Hope, or Pedro Alonso Niño (1468–1505), who piloted the *Santa María* for Columbus, were office-holders, functionaries, often hoping for rewards alien to their science. Their knowledge was to a great extent instrumentalized: this was its weakness and also its power—the intellectual weakness of servility, and the pragmatic power of an immense imperial machinery recording, organizing, systematizing. The Arabic nautical corpus is witness to the refinement of empirical observations by generations of scholars, of the tense interplay between theoretical principles and technical know-how advancing knowledge, of the primacy given to evidence—all these elements were there already, and yet no scientific revolution came of it.

Conclusion

The accounts of the rounded knowledge and character of the Arab pilots, and their dual ability in mind-work and hand-work, *raciotinatio* and *fabrica*, are not alien at all to contemporary Renaissance craftsmen who were propelling the “new science.” Their appraisal of experience, as seen above, is quite in tune with Leonardo’s mention of “bona sperientia,” as the “commune madre di tutte le scientie e arti.”⁴⁴

41 Brendecke, *Imperio e información*, 19.

42 Nuria Valverde and Antonio Lafuente, “Linnaean Botany and Spanish Imperial Biopolitics,” in *Colonial Botany: Science, Commerce, and Politics in the Early Modern World*, ed. Londa Schiebinger and Claudia Swan (Philadelphia: University of Pennsylvania Press, 2007), 293.

43 Valverde and Lafuente, “Linnaean Botany and Spanish Imperial Biopolitics,” 279.

44 Leonardo da Vinci, *The Notebooks of Leonardo da Vinci*, ed. Jean Paul Richter, 2 vols (New York: Dover Books, 2012), I:18.

Coming back to what I have called the horizontal transmission of knowledge, the traceable lineages of teachings, with their more or less untraceable kinship and suggestive parallels, we may consider the centuries-long persistence of fundamental notions about craft and theoretical knowledge, weaving their ways through cultures and languages. The influence of the *Timaeus* and of Vitruvius on the Italian Renaissance is well attested to say the least, as in the cases of Filarete and Francesco di Giorgio in the late fifteenth century,⁴⁵ or Dürer in the early 1500s, speaking of his artisanal experience as a synthesis of *Kunst* (“art,” informed by “intellectual understanding”) and *Brauch* (custom, involving practical skill).⁴⁶ Only a little later in the sixteenth century, the publication of Pedro Nunes’s *De arte atque ratione navigandi* (Coimbra, 1573) brings these several issues completely within our nautical ken. When Nunes affirms that the Portuguese mariners were not just going around the ocean on hit-and-miss expeditions (*indo a acertar*), but that they were “very instructed and armed with instruments and rules of astronomy and geometry” (*mui ensinados e providos de estormentos e regras de astrologia e geometria*),⁴⁷ this is once again in tune with the Arab pilots’ views. There is unquestionably a degree of sophistication in Nunes’s work which has to do with his mathematical genius and unique contributions, but there is something in his relationship with pilots that stands out as different from what transpired in the Indian Ocean a hundred years earlier. It is not just the mutual awareness between navigators and mathematicians, for Ibn Mājid was conversant with the medieval astronomical literature, and al-Mahri even contributed to it, but the fact that there was a state-sponsored and state-regulated relationship between them. Nunes had been appointed by the Portuguese crown as an officer in charge of instructing the pilots. Thus, as the crown co-opted and instrumentalized both their and Nunes’s knowledge and experience, a new breed of navigators and a new nautical science came into being.⁴⁸

Nothing even remotely close to such an institutionalized relationship existed for Indian Ocean pilots, and yet, unexpectedly, what appears to sum up the relationship between this new science and nautical knowledge—token words like “exactitude,” “rigor,” and the seventeenth-century

45 See Pamela O. Long, *Artisan/Practitioners and the Rise of the New Sciences, 1400–1600* (Corvallis: Oregon State University Press, 2011), 77–78, 80.

46 See Smith, *The Body of the Artisan*, 69–72.

47 Henrique Leitão, “Ars e ratio: A náutica e a constituição da ciência moderna,” in *La ciencia y el mar*, ed. María Isabel Vicente Maroto and Mariano Esteban Piñeiro (Valladolid: Universidad de Valladolid, 2006), 190.

48 For valuable insights and references regarding this interplay between “universal detached bureaucracy” and “contingent sailor practice,” see Lobo-Guerrero’s chapter in this volume.

consolidation of a dual methodology based on 1) rules of mathematical certainty, and 2) experience- and observation-based know-how⁴⁹—appears most familiar within the context of the Indian Ocean navigation of the fifteenth century. I do not mean to establish blanket identifications and to overlook particularities, but to draw attention to this unexpected common ground, from which research into particulars can be better articulated.

Writing still on the horizontal transmission and on the views on ancient authority, Nunes refers to the innovative character of his relationship to navigators explaining that while he differed occasionally from the method of Menelaus, Ptolemy, and Jābir (Geber), he was not at all diverging from Euclid or Theodosius.⁵⁰ Similarly, the more one examines the Arabic nautical sources—without losing sight of classical and late antique sources—the more unlikely it appears that there ever was a clear break with ancient cosmology.⁵¹ This is not the place to address the variations of the continuity thesis, but as suggested in the previous pages, there is much in the domain of science that remains unchanged beyond all the talk and fanfare of revolutions. Perhaps what could be seen as a real innovation or the key difference in the European sphere is, to use Spengler's terminology, the Faustian "technical Will-to-Power," and the basic "idea of immediately exploiting in practice any knowledge."⁵²

To turn now to the vertical transmission I have mentioned, we can see how, even within the imperial drive and as if between the menacing strides of the European juggernaut, remnants persisted of the cosmological awareness common to *Timaieus* and the Abrahamic cosmogonies. They manifest above all as the vivid and perpetually renewed awareness of a cosmological order, as belonging with and having duties towards an intelligible and also merciful creation: "Because the artisan imitated the processes of nature in his creation of works of art from the material of nature, he had a better understanding of nature, and because he was in contact with God's Creation, he also possessed a better knowledge of God's revelation."⁵³ These remnants, however diminished and meek, reenact, often through art and ritual, a very

49 Leitão, "Ars e ratio," 206–207.

50 Leitão, "Ars e ratio," 193.

51 For a full metaphysical comparative treatment of one case study, see Acevedo, *Alphanumeric Cosmology from Greek into Arabic*.

52 Oswald Spengler, *The Decline of the West* (New York: A. A. Knopf, 1939), 300–301.

53 Pamela Smith, "Laboratories," in *The Cambridge History of Science*, Vol. 3: *Early Modern Science*, ed. Katharine Park and Lorraine Daston (Cambridge: Cambridge University Press, 2006), 298, <https://doi.org/10.1017/CHOL9780521572446.014>.



Figure 7.2. Top of the façade of the church of Our Lady of Needs (Nossa Senhora das Necessidades) in Lisbon. The baroque budded cross at the top, with the diagonal rays, seems to visually replicate the sixteen rhumbs of the wind rose below. This church was the home of the Lisbon Oratorian Fathers, who in later times, for about a century, taught mathematics, astronomy, and other disciplines to the Portuguese navigators.⁵⁴ The harmony between the cross, representing meta-physical and theological doctrines, and the technoscientific division of space, represented by the wind rose, is in perfect agreement with the “vertical” vision of world-crafting laid out in *Timaeus* and verified at every turn throughout the Middle Ages. For a detailed study of this question, down to the thirteenth century, see Acevedo, *Alphanumeric Cosmology from Greek into Arabic*.

European drama between its own tendencies to pure science and politicized science. Our efforts at further understanding their dynamics, and the crucial role of these dynamics in the advent of a new global scientific order, are all the better oriented if they take into account such gentle voices.⁵⁴

Acknowledgements

The underlying research was financed by ERC Rutter Project. Financed by Fundação para a Ciência e a Tecnologia, I.P./MCTES through national funds

⁵⁴ See Kenneth Maxwell, *Pombal, Paradox of the Enlightenment* (Cambridge: Cambridge University Press, 1995), 13–14.

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8. From the Anecdote to the Report: Indian Ocean Pilots in Sixteenth- Century Portuguese Literature

Inês Bénard

Abstract: It is widely recognized in both academia and among broader audiences that the Portuguese gained insights from Indian Ocean navigators upon entering that sea. This chapter aims to examine the body of sixteenth-century Portuguese maritime literature that references these navigators, arguing that this approach clarifies questions about how the Portuguese sought expertise in the Indian Ocean, the type of knowledge they pursued, and their general attitude toward the information they received. It intends to demonstrate not only the potential of Portuguese maritime literature in studying the circulation of knowledge between two distinct practices but also how it can enhance our understanding of the technical aspects of Indian Ocean navigation during the fifteenth and sixteenth centuries.

Keywords: circulation of knowledge, Arab navigation, Iberian navigation, Indian Ocean, sea pilots, Portuguese maritime literature.

Introduction

There is a story about the first time Vasco da Gama (1524–1524) sailed to India. The fleet had just managed to round the Cape of Good Hope in 1498 and ventured at long last into a new ocean, marked with different winds, currents, and coasts. The question that followed was how to proceed and reach India by sea in the fastest and safest way possible. There was no obvious answer. The Portuguese fleet started to sail up the east coast of Africa

searching for one who could lead its ships in the right direction. They sailed as far north as Malindi, in present-day Kenya, and it was there that Vasco da Gama finally met with a king who provided him with the right person.

The story about the navigator who led Vasco da Gama to India for the first time has been told repeatedly throughout history. The sixteenth century alone saw a number of works produced by sailors, historians, writers, and poets that would later become references for other authors. Each of these relates the same story from a slightly different angle, as can be perceived by considering a small sample of such works: the anonymous journal of the voyage;¹ the historical narrative *Ásia*, written by João de Barros (1496–1570) in 1552;² and the epic poem *The Lusiads*, completed by Luís de Camões (ca. 1524–1580) in 1572.³ While all tell about how the king of Malindi provided da Gama with a trustworthy navigator, they vary, emphasizing or omitting details according to their genre and the intention of their authors. The anonymous journal of the voyage is believed to have been written by Álvaro Velho, a Portuguese convict who was left in Guinea on the way back. It is the only direct source extant, and it briefly mentions a Christian navigator who pleased everyone in the crew.⁴ João de Barros was himself a historian working in the service of the king and a former administrator of the Casa da Índia—the institution where the majority of documents related to oceanic voyages were kept. He is thought to have been the first Portuguese author to make extensive use of Asian material in his chronicles,⁵ and describes the conversation that presumably took place between Vasco da Gama and the “Moorish navigator, Gujarati by nation.” João de Barros states that Vasco da Gama considered the Indian Ocean navigator to be a great treasure (*um gram tesouro*).⁶ The poet Luís de Camões adds little to the identity of this

1 Vasco da Gama and, *Em Nome de Deus: The Journal of the First Voyage of Vasco Da Gama to India, 1497–1499*, ed. and tr. Glenn Joseph Ames, European Expansion and Indigenous Response 4 (Leiden: Brill, 2009).

2 João de Barros, *Ásia: Dos feitos que os portugueses fizeram no descobrimento e conquista dos mares e terras do Oriente*, version Nova edição oferecida a ... D. Maria I, ed. Hernani Cidade, vol. Década Primeira (Lisboa: Divisão de Publicações e Biblioteca Agência Geral das Colónias, 1945).

3 Luís Vaz de Camões, *The Lusiads*, trans. Landeg White (Oxford: Oxford University Press, 1997).

4 Gama, *Em Nome de Deus*, 67.

5 João Teles e Cunha, “Oman and Omanis in Portuguese Sources in the Early Modern Period (ca. 1500–1750),” in *Oman and Overseas*, ed. Michaela Hoffmann-Ruf and Abdulrahman Al-Salimi, Studies on Ibadism and Oman 2 (Hildesheim: Georg Olms Verlag, 2013), 232.

6 João de Barros, *Da Ásia: Década Primeira*, vol. 1 (Lisboa: Regia Officina Typografica, 1777), 320.

man and simply says that he came from Malindi. *The Lusiads* nonetheless emphasizes that “in his [i.e., da Gama’s] new navigator there was no deceit / Just an expert knowledge of the course / So he cruised now with a greater ease of mind / Than in the latitudes they left behind.”⁷

The story became famous, but it was in no way a singular event. On the contrary, the frequency of interactions between Portuguese and Indian Ocean sailors only increased with repeated Portuguese voyages, as scholars now fully acknowledge. What remains unclear is the way in which such encounters occurred, and the kind of information that was being shared. The present chapter tries to approach these questions by assessing a corpus of Portuguese maritime sources of the sixteenth century. It will question the way in which Indian Ocean navigators were mentioned and confront those references whenever required with Arab nautical sources from the same period. Portuguese maritime literature encompasses a variety of texts connected to oceanic navigation, including technical works meant to be used on board (such as seafaring instructions, rutters, logbooks, and nautical charts); geographical accounts; personal notes and letters; and narratives and chronicles. This chapter focuses on references to Indian Ocean navigators within this body of documents, and starts by placing such mentions into the contexts in which they are presented in the work. While such allusions display a degree of variability, their differences are seldom extreme. Some authors, for example, mention Indian Ocean navigators as guiding Portuguese ships; others speak of them because of something they had said or showed. Indeed, a typology can be proposed for these references and their contexts. Drawing on a diverse set of sixteenth-century Portuguese documents, this chapter will argue that when Indian Ocean navigators appear, they do so within at least one of four broad contexts: the offering of guidance; situations of conflict; transmission of non-navigational information; and in connection with instruments.

First, the chapter introduces and comments on each context, as a way to get a sense of the interactions occurring between Portuguese and Indian Ocean navigators, and then analyzes examples of encounters described in Portuguese sources. In sections concerning instruments and nautical techniques, this information is juxtaposed with accounts appearing in Arab nautical texts. These latter texts constitute the second group of sources for the present study, and are the work of two Arab navigators active in the early to mid-sixteenth century. The first of these authors, Ahmad Ibn Mājid, was born around 1420 and is known to have composed over thirty poems

7 Camões, *The Lusiads*, 120.

and one major prose work, called *Fawā'id fī uṣūl 'ilm al-baḥr wa-al-qawā'id* ("Commentaries on the Principles and Foundations of Maritime Science").⁸ The second, Sulaymān al-Mahrī, was born in Shiḥr, in Southern Yemen, and wrote five prose works on navigation and astronomy, including *Al-'Umdat al-mahrīyah fī ḍabṭ al-'ulūm al-baḥrīyah* ("The Reliable Mahrī Treatise on the Exactitude of Maritime Sciences"),⁹ which is considered to be his most important contribution.¹⁰

The aim of this study is simple: to demonstrate the relevance of Portuguese nautical literature to scholarship on the interactions between two groups of navigators. It is to be noted that a limitation of any such research, even that embracing a wider range of sources than the present chapter, is affected by an inherent difficulty facing historians of these topics: namely, that nautical expertise was often taught and shared tacitly, that is, by experience. Most navigators from either side were largely illiterate and felt no personal desire to write down the details of contact with their counterparts. The reason why some Portuguese did was often related with fact that they were instructed to do so by the state.

A note concerning terminology is in order before proceeding. The chapter refers mainly to indigenous navigators from the Indian Ocean because this was the term that seemed to best encompass the local navigators mentioned by the Portuguese. The sources themselves, however, rarely describe a navigator as being *of* or *from* the Indian Ocean, and only at times do they call these individuals *local*. The term that is most often used—albeit not always—is "Moor" or "Moorish" (*mouro*). This was a designation commonly applied by the Portuguese of the sixteenth century to anyone who was Muslim, and reveals very little about the Indian Ocean navigators thus termed. Islam was widely spread through the Indian Oceanic coasts and islands by the sixteenth century, and sailors were constantly moving between different places. The

8 Aḥmad Ibn Mājid, *Arab Nautical Sciences: Navigational Texts and Their Analysis*, part II, *Aḥmad Ibn Mājid's Works*, ed. Ibrahim Khoury, Kitāb al-Fawā'id Fī Usul Ilm al-Baḥr Wal-Qawā'id (Damascus: Arab Academy of Damascus, 1971).

9 Sulayman al-Mahrī, *Arab Nautical Sciences: Navigational Texts and Their Analysis*, part I, *Sulayman al-Mahrī's Work*, ed. Ibrahim Khoury, vol. 1: *Al-'Umda al-Mahrīyya fī ḍibṭ al-'ulūm al-baḥrīyah*, 2 vols., 3 (Damascus: Arab Academy of Damascus, 1970).

10 For more information in Indian Ocean navigational sources until the arrival of the Portuguese see: Juan Acevedo, Inès Bénard, and Juliane Müller, *Indian Ocean Arab Navigation Studies Towards a Global Perspective: Annotated Bibliography and Research Roadmap*, 5.1, RUTTER Technical Notes 2 (Lisbon: ERC RUTTER Project, 2023), <https://doi.org/10.5281/zenodo.10462161>. For more details about these two authors and their literary genre, see also chapter 9 by Juan Acevedo in the present volume, "Precious Art or Tried and Tested Science: Early Modern Indian Ocean Navigation in Context."

population of Malindi is described by Camões as Moorish (*mouros*); João de Barros speaks of a “Moorish navigator, Gujarati by nation.”¹¹ Duarte Barbosa (ca. 1480–1521) mentions “Moors” living in East Africa, India, and Southeast Asia.¹² Yet not all Indian Ocean navigators featured in Portuguese texts were Muslims, even when they were described as being so. Their religion was often misunderstood (especially for Indians), as common sailors were rarely the chief focus of the descriptions in which they appear. The Gujarati navigator who guided Vasco da Gama was said in the logbook of the voyage to have been Christian, for instance. There are also times when the religion of sailors is wholly unspecified. Bernardo Fernandes simply refers to the navigators of Zanzibar as locals (*da terra*).¹³ Whatever the case may be, these navigators do seem to have used the same general practices of navigation, which was then adapted locally or according to the routes performed. The terms *indigenous* or *from the Indian Ocean* seemed for this reason to be an adequate descriptor. Whenever presenting direct translations, however, I will retain the word Moorish.

Finally, it remains to be stated that this chapter is influenced to a great extent by the concept of circulation of knowledge in the way it has been proposed by scholars such as James Secord,¹⁴ Pamela Smith, and Kapil Raj. Its premise (and the conclusions it extrapolates) are shaped by the idea that the production of knowledge is intrinsically linked with communication. Knowledge moves between groups or individuals as it is communicated; movement imposes conditions that act upon and consequently alter that which was initially shared.¹⁵ The acceptance of this process as a key factor for the production of knowledge has several implications with respect to historiography. The most relevant here is the notion that artisans and practitioners are to be regarded as active agents, especially if they are seen to circulate between social and/or physical frontiers; they carried and disseminated knowledge as they went.

The expansion of commerce and trade routes in the early modern period caused thousands of people to move from their homelands, taking instruments, texts, and practices along with them. As Pamela Smith has argued,

11 Barros, *Da Asia: Década Primeira*, 1:319.

12 Duarte Barbosa, *Livro em que dá relação do que viu e ouviu no oriente*, edited by Augusto Reis Machado (Lisboa: Agência Geral das Colónias, 1946).

13 Bernardo Fernandes, *Livro de marinharia de Bernardo Fernandes*, ed. Abel Fontoura da Costa (Lisboa: Agência Geral das Colónias, 1940).

14 James A. Secord, “Knowledge in Transit.” *Isis* 95, no. 4 (2004): 654–672.

15 Kapil Raj, “Beyond Postcolonialism ... and Postpositivism: Circulation and the Global History of Science,” *Isis* 104, no. 2 (June 2013): 341.

this movement prompted new ways of engaging with and understanding nature that encouraged the formation of novel connections between different social and cultural groups and, ultimately, the development of new intellectual hierarchies.¹⁶ Various examples could be provided to show that such a phenomenon was happening all over Europe in the sixteenth and seventeenth centuries, but few would be as early and as unmistakable as the movement of Portuguese sailors into the Indian Ocean. Navigators with little or no formal education were made responsible by the state for collecting and describing geographical and astronomical information that chief cosmographers would later examine and incorporate into their works. What is more, both the state and the sailors felt a constant need for development as a way to guarantee that the voyages would be as safe and fast as possible. For this to happen, they relied mainly on information that had been tested or acquired by experience, according to planned procedures. When the Portuguese arrived as newcomers in an ocean that was already the scene of a fully developed navigation practice, they were naturally drawn, in their quest for knowledge, to those who were already experts. This chapter thus seeks to explore how Portuguese maritime literature can clarify such interactions, both in the way they took place, and the kind of information that was shared.

8.1. Guidance: Quests for Guidance, Advice on Local Navigation, and Provision of Technical Information

The most common capacity in which Indian Ocean navigators appear in Portuguese texts is as providers of guidance. The term *guidance*, however, is too broad for the heterogeneity of circumstances to be addressed. It will be subdivided here into three categories: quests for guidance; advice on local navigation; and provision of technical information.

8.1.1. *Quests for Guidance*

Quests for guidance include any passage referring to Indian Ocean navigators being sought out to lead Portuguese ships. Seafaring manuals and rutters rarely include such examples, as they tend to focus on technical information and describe it in the briefest way possible. Accounts of these episodes tend to appear, instead, in logbooks or voyage accounts. The logbook of the first

16 Pamela H Smith, "Science on the Move: Recent Trends in the History of Early Modern Science," *Renaissance Quarterly* 62, no. 2 (2009): 374.

voyage of Vasco da Gama to India is one example, describing the attempts made by the Portuguese fleet to find local navigators after reaching the coast of Mozambique. The anonymous description of the voyage of Magellan is another, recounting efforts to seize navigators in Southeast Asia in 1521.¹⁷ João de Castro (1500–1548) also describes episodes of this kind in a letter to King João III in 1541 when telling of the voyage that led to the production of his famous rutter.¹⁸ Castro had been participating in an expedition headed by Estevão da Gama (1430–1497) to Suez to face a Turkish fleet. The letter explains how local governors had been instructed not to provide the Portuguese with navigators and comments that they were often confronted with rulers unwilling to negotiate, as in Bab-el-Mandeb, or deserted islands like Dahlak. While this information was written in the letter to the king, it was omitted from the rutter of the same voyage. Apparently, such detail was deemed relevant to a report on the voyage, but not appropriate to include in a rutter for future sailors to follow.

Chronicles and narratives contain similar scenarios. João de Barros wrote that it was much easier for the captain, Pedro Álvares Cabral (1467/8–ca. 1520), to find Indian Ocean navigators in Mozambique in 1500 than it had been for Vasco da Gama some years before.¹⁹ The *Commentaries of Afonso de Albuquerque* relate how the captain hired a navigator from Cananor to sail to Mozambique in 1504. This was a work written in 1557 by Afonso Brás de Albuquerque (ca. 1501–1581), the son of the captain and later viceroy of the Indies Afonso de Albuquerque (ca. 1450–1515), and it narrates the story of the author's father in the Indian Ocean. In this specific example, the book tells how the captain trusted the navigator against the advice of everyone in the crew, who feared he would be deceitful:

But the Moor was so good at that craft and knew the path so well, that he led him straight to Mozambique by way of good navigation, with no flaw. And there he [i.e. Afonso de Albuquerque] left him, giving fifty *cruzados* for his work.²⁰

17 “Viagem que fez Fernã[o] de magalhais pera malluco o anno de 1519,” fl. 57r–64v. In: Regimiento de navegacion y Roterio de muchas y varias navegaciones p.^a muchos lugares, BnF, Département des manuscrits, Ms. Portugais 40: 60r.

18 D. João de Castro, *Obras completas de D. João de Castro*, ed. Luís Albuquerque and Armando Cortesão, vol. 3, *Correspondência e documentos* (Coimbra: Academia Internacional da Cultura Portuguesa, 1968).

19 Barros, *Da Asia: Década Primeira*, 1:397.

20 Afonso Brás de Albuquerque, *Comentários do grande Afonso de Albuquerque*, ed. António Baião, vol. 1, Parte I e II (Coimbra: Imprensa da Universidade, 1923), 17.

8.1.2. *Advice on Local Navigation*

A second category within the context of guidance is advice on local navigation. Rutters and geographical works commonly include sections on the regions, coasts, or harbors that are deemed to be particularly hard to navigate. Sailors facing those challenges were often advised to seek the help of local navigators. The “Rutter of the Red Sea” by João de Castro is a case in point.²¹ It describes the expedition to Suez that is mentioned above by means of sailing instructions and nautical charts. João de Castro comments there that the strait of the Red Sea should be sailed drawing “closer to mainland than to the islands and, most of all, it is my opinion that no one should cross it without a local navigator.”²² Bernardo Fernandes makes a similar remark in his seafaring manual to Zanzibar. This work starts with a set of instructions on techniques that navigators should master, and it continues with a rutter from Portugal to India. The book warns the readers that anyone lacking experience in the vicinity of Zanzibar would not be able to cross it; sailors are advised instead to search for local navigators there.²³ The same kind of passages appear in geographical works describing Indian Ocean coastal lands and their populations. The first Portuguese ambassador to China, Tomé Pires (ca. 1465–ca. 1540), wrote in his *Summa oriental* from 1515 that the harbor of Martamane in Myanmar was dangerous and had navigators (i.e. pilots) who led ships inside.²⁴ Duarte Barbosa likewise observed that navigation close to Guidarim in India was hazardous due to sea currents: “So much so that *naus* wanting to enter here take navigators from the land. For when the tide lowers, they know how to remain in landing points and places known there.”²⁵ The *Livro* of Duarte Barbosa occasionally provides hints about the local navigation practiced in the lands he is describing. The islands of Mozambique were, for instance, said to have been a common stop for the “Moorish navigators who sailed to Sofala and Cuama.”²⁶

Narratives and chronicles do not often include passages such as these, for they aim at wider audiences, rather than the specific demographic of people who might actually sail. What they most often describe are sea

21 D. João de Castro, “Roteiro do Mar Roxo,” in *Obras completas de D. João de Castro*, ed. Luís Albuquerque and Armando Cortesão (Coimbra: Academia Internacional da Cultura Portuguesa, 1968), 2:171–379.

22 Castro, “Roteiro do Mar Roxo,” 224.

23 Fernandes, *Livro de marinharia de Bernardo Fernandes*, 77.

24 Tomé Pires, *Suma oriental*, ed. Rui Manuel Loureiro (Lisboa: Centro Científico e Cultural de Macau, 2017), 135.

25 Barbosa, *Livro em que dá relação*, 77.

26 Barbosa, *Livro em que dá relação*, 22.

crossings that ships were able to negotiate with great precision thanks to Indian Ocean navigators on board; or the opposite, when they struggled to do so because of a lack of such people. João de Barros provides an example when recounting a battle in 1507 between the captain, Lourenço de Almeida (ca. 1480–1508), and a local captain in Cochín. The latter was said to have had a great advantage when the fleets met in the river, for he had Indian Ocean navigators with him.²⁷ Barros also describes how Captain Afonso de Albuquerque struggled to cross the Bab-el-Mandeb in 1513. This was a reputedly dangerous strait to navigate, especially with large ships, “and Afonso de Albuquerque had no navigators of this [strait]. At this entrance there is an entire population of these navigators, similarly to those in the bank of Flanders, whose trade was to steer ships away from those hazards.”²⁸

8.1.3. *Provision of Technical Information*

The third and last category concerns the provision of technical information. It occurs every time an author specifies what navigators said or suggested on certain occasions and appears in various kinds of works of maritime literature. The “Rutter to the Dahlak Islands” by the navigator and cartographer Francisco Rodrigues is a particularly telling example.²⁹ It describes a voyage commissioned by Afonso de Albuquerque from Aden to the Dahlak Islands in 1513, on which Francisco Rodrigues was assigned to sail a caravel with a local navigator, recording all the instructions that were given along the way. The rutter that resulted from these notes mentioned, for example, that from Bab-el-Mandeb

we made our way due northeast and a point to west according to the instruction given by the Moorish Roban navigator; we reached fifteen fathoms deep because the wind had calmed.³⁰

The “Rutter of the Red Sea” by João de Castro also includes several passages specifying information provided by the Indian Ocean navigators on board, such as sandbanks and rocks close to Anfila Bay.³¹ These two works

27 João de Barros, *Da Ásia: Década Segunda*, vol. 1 (Lisboa: Regia Officina Typografica, 1777), 189.

28 João de Barros, *Da Ásia: Década Segunda*, vol. 2 (Lisboa: Regia Officina Typografica, 1777), 254–255.

29 Francisco Rodrigues, *O livro de Francisco Rodrigues. O primeiro Atlas do Mundo Moderno*, ed. José Manuel Garcia (Porto: Universidade do Porto, 2008).

30 Rodrigues, *O livro de Francisco Rodrigues*, 43.

31 Castro, “Roteiro do Mar Roxo,” 224.

by Francisco Rodrigues and João de Castro are exceptional: most rutters were written in a direct and rather mechanical way, simply transmitting the necessary steps to move from one place to another. If it was the case that these rutters incorporated local knowledge, they did so, in large part, silently. Indeed, Pierre-Yves Manguin has argued that the second rutter in the *Book by Francisco Rodrigues* (describing a route to China) was most likely a copy of a local Javanese text, since the units of distance commonly used by the Javanese were retained, and no attempt was made to convert them to Portuguese leagues.³²

Journals and logbooks of voyages contain passages within this category as well. The journal of the voyage of Vasco da Gama provides brief references related to the places the ships were heading. It states, for instance, that the navigators taken on board in Malindi suggested that they could show the Portuguese the way to the island of Kilwa.³³ The anonymous journal of the Magellan voyage to the Moluccas notes that the fleet took three navigators on board, and gives the route sailed from that point until the time the ships reached an island, which the navigators identified as Borneo.³⁴

Narratives likewise discuss the provision of information. A good example is *The Commentaries*, as it frequently mentions Afonso de Albuquerque sailing with navigators of the Indian Ocean on board and seeking their advice on nautical matters. Some of these instances are described in more detail, others less so. *The Commentaries* relate, for instance, that a fleet led by Afonso de Albuquerque decided to set sail from Socotra to Arabia during the new moon on August 10, 1507 “because that was the time the Moorish navigators he brought from Malindi said it was possible to sail the Arabian coast.” Albuquerque assembled all captains and navigators at a later stage of the same voyage, both Muslim and Christian, to debate whether it would be best to sail towards Mecca or Ormuz (the verdict was Ormuz).³⁵ This and other episodes are sometimes touched upon in more than one kind of text, allowing comparison of the descriptions in narratives with those in logbooks or rutters. The voyage to the Red Sea made by João de Castro in 1541 is one such case: it is discussed first in a letter to the king, later in his “Rutter of the Red Sea,” and then in Diogo de Couto’s *Ásia*. The kind of

32 Pierre-Yves Manguin, *Les Portugais sur les côtes du Viêt-Nam et du Campā*, Publications de l’école Française d’extrême-Orient, LXXXI (Paris: École française d’extrême-orient, 1972), 51–60.

33 Gama, *Em Nome de Deus*, 58.

34 “Viagem que fez Fernã[o] de magalhais pera malluco o anno de 1519,” fl. 57r–64v. In: Regimiento de navegacion y Roterio de muchas y varias navegaciones p.^a muchos lugares, BnF, Département des manuscrits, Ms. Portugais 40: 61r–61v.

35 Albuquerque, *Comentários do grande Afonso de Albuquerque*, 1: Parte I e II:55.

technical information that is said to have been mentioned by local navigators in the rutter is not found anywhere else. Diogo de Couto (ca. 1542–1616) only refers to local navigators when adding that they were against sailing larger ships near Massawa, “due to both the inconvenience of the time, that was late, as well as the several risks and sandbanks.”³⁶

8.2. Conflict

It has already been suggested above that interaction between Portuguese and local navigators was hostile on several occasions. There were instances where navigators were hired in port cities to assist in certain voyages; but there were also times when they were taken against their will. Portuguese imperial ambitions of controlling maritime trade in the Indian Ocean often led to aggressive encounters, captured by some of these sources. The narratives in fact describe the wars, destruction, death, and torture arising from attempts to monopolize major ports and sea traffic, and local navigators were caught up in the middle of these events.

Nautical works do not often describe situations of conflict, as they often limit themselves to giving instructions. The rutter to the Dahlak Islands by Francisco Rodrigues is an exception. The fleet led by Afonso de Albuquerque was aimed at attacking Egyptian ships and there were probably some tensions between the Portuguese crew and the local navigator on board. This is implied at the end of the rutter, when it is suggested that the navigator started to mislead them at a certain stage of the voyage. Rodrigues was forced to correct the information he had noted and added the following passage:

So, instead of going due east and a point northeast, go on for two leagues until you have reached the canal. From there, go due west because this navigator wanted to excuse himself from showing the way. He got lost and did so on purpose.³⁷

Logbooks and descriptions of voyages do refer to these conflicts, most likely because they impacted on the overall course of the voyage. The logbook of the voyage of Vasco da Gama offers some examples related to the first navigators taken in Mozambique. When one of them fled to an island and was pursued by the Portuguese, local ships came in defense of the

³⁶ Diogo de Couto, *Da Asia. Década V* (Lisboa: Regia Officina Typografica, 1779), 2:117–118.

³⁷ Rodrigues, *O livro de Francisco Rodrigues*, 44.

navigator and were bombarded in retaliation.³⁸ This was a violent episode described in particular detail, but others were mentioned only briefly, such as when the logbook comments on a group of islands near Mozambique. One of these was said to have been called “Ilha do Açoutado” (Island of the Flogged-one), because “[the navigator] told him [i.e., the captain] that these islands were the mainland, and for this lie the captain ordered him to be flogged.”³⁹ There are also passages that are less violent. Some are mere complaints similar to the one of Francisco Rodrigues above. The logbook of the voyage of Vasco da Gama tells, for instance, that a second navigator taken in Mozambique was assigned to stop along the coast and look for water. He is described by the author as having been more eager to flee than to show them anything.⁴⁰ The description of the voyage of Magellan also describes situations of conflict. The crew heard of an old navigator in a group of islands called Samym, who at first wanted to guide them to the Moluccas. After a while he changed his mind, decided not to go, and fled; and “[t]hen they got him and arrested him along with others who were with him and who knew of navigation.” The next day the fleet approached an island. “The wind had calmed, and the currents drew the ship closer to the coast where the old navigator threw himself into the sea and withdrew to land.”⁴¹ In his letter to King João III, João de Castro simply refers to how a king had delayed the voyage by promising navigators who never came.⁴²

Chronicles and narratives contain a fair number of situations of conflict. *The Commentaries of Afonso de Albuquerque* are one example. It has already been mentioned that the expedition to Ormuz along the Arabian coast had Indian Ocean navigators on board. They were aware that Albuquerque was planning to wage war against those who refused to obey the law of the Portuguese, and they remained silent when passing by the port of Sohar. When Afonso de Albuquerque asked about this city, the navigators replied that it was a place endowed with such power that they would not dare to take him there. Albuquerque became so suspicious that his navigators were tricking him into missing important lands that he threatened to have

38 Gama, *Em Nome de Deus*, 52–53.

39 Gama, *Em Nome de Deus*, 58.

40 Gama, *Em Nome de Deus*, 55.

41 “Viagem que fez Fernã[o] de magalhais pera malluco o anno de 1519,” fl. 57r–64v. In: Regimiento de navegacion y Roterio de muchas y varias navegaciones p.^a muchos lugares, BnF, Département des manuscrits, Ms. Portugais 40: 62v–63r.

42 Castro, *Obras completas de D. João de Castro*, 3:33.

them drowned were they to skip any other place.⁴³ There were more violent instances still. Cities were at times sacked, ships destroyed, and only the lives of some were spared, including those of navigators. João de Barros describes an attack on a local ship in 1502 where just over twenty children and one navigator survived.⁴⁴ *The Commentaries* tell of an attack on Socotra in 1507 where “they held one who gave himself in, from whom Afonso de Albuquerque benefited on the Arabian coast where he [later] sailed. Because this Moor was a great navigator of that coast.”⁴⁵

8.3. Non-Navigational Information

Portuguese documents at times register instances where navigators are queried on matters that were not strictly nautical. The nature of those inquiries is varied and often depends on the author who decided to write them down.

Nautical works, once again, do not often contain this sort of information, tending to be as straightforward and technical as possible. A notable exception is the “Rutter of the Red Sea” by João de Castro. The text is often similar to a logbook in the sense that it describes each day of the voyage and furnishes miscellaneous information deemed relevant about the region. What is particular about this text is that João de Castro constantly compares his experience of the Red Sea with the information in classical geographical accounts of Ptolemy and Pliny, or with popular knowledge. It is filled with instances where questions about a variety of topics were asked not only of Arab navigators, but also of the local populations encountered along the way. One of the best examples of information provided by navigators on non-navigational matters is a reflection about the reason that the sea was called *Red*. João de Castro mentions that Pliny had proposed two possibilities. One was that the Sea used to be a space ruled by a king called *Erithra*—which meant *red* in Greek; the other was that the intensity of the solar rays caused the sea to turn red. “From these opinions” —the rutter goes—“authors have chosen the one that suits them better and the one they thought was best.”⁴⁶ A contemporary authority who had also asked about

43 Albuquerque, *Comentários do grande Afonso de Albuquerque*, 1: Parte I e II:85.

44 João de Barros, *Da Asia: Década Primeira*, vol. 2 (Lisboa: Regia Officina Typografica, 1777), 38.

45 Albuquerque, *Comentários do grande Afonso de Albuquerque*, 1: Parte I e II:51.

46 Castro, “Roteiro do Mar Roxo,” 379.

this matter was Afonso de Albuquerque. The king himself wanted to know the reason behind the name of this sea, and Albuquerque argued in a letter that the name was most fitting, for he saw that the water was full of red spots near the strait of Aden.⁴⁷ João de Barros⁴⁸ and the *Commentaries*⁴⁹ tell this story, noting how Albuquerque had questioned local navigators, who confirmed his opinion. The explanation would subsequently become popular. João de Castro commented that the Portuguese at the time would explain the formation of these red spots, maintaining that it was the color of the land along the Arabian coast. Thunder and strong winds, the story goes, would move dust into the seas, and the currents would form red spots. The problem, according to João de Castro, was that the spots did not exist. The color of the water was the same as anywhere else, and the wind did not seem to have any special effect on it. It was only north of Sawakin, miles away from Aden (where Albuquerque never sailed), that the bottom of the transparent sea could be seen, filled with red coral. The conclusion of the rutter is the following:

I have often inquired of Moorish navigators and people interested in antiquities who live in this part of the strait about the name of this sea. Everyone told me that they knew of no other name than the Sea of Mecca, and they were often surprised that we call it the Red Sea. I asked the navigators if they thought the sea was blurred with red from the dust that was brought by the wind—they replied that they had never seen such a thing.⁵⁰

The “Rutter of the Red Sea” by João de Castro is a peculiar sort of sea rutter, since the kind of sources that most often refer to non-navigational information are logbooks and first-hand descriptions of voyages. The great majority of these concern the qualities of nearby lands and the populations living there (likely due to the fact that the authors of the texts were sailing in unfamiliar waters). Such travelers did not know what to expect and asked their questions of the experienced navigators on board. The journal of the

47 João de Barros, *Ásia: Dos feitos que os portugueses fizeram no descobrimento e conquista dos mares e terras do Oriente. Década Segunda*, Nova edição oferecida a ... D. Maria I, ed. Hernani Cidade, vol. Década Segunda (Lisboa: Divisão de Publicações e Biblioteca Agência Geral das Colónias, 1945), 358.

48 Barros, *Da Ásia: Década Segunda*, 2:260.

49 Afonso Brás de Albuquerque and António Baião, *Comentários do grande Afonso de Albuquerque*, vol. 3, Parte IV (Lisboa: Regia Officina Typografica, 1774), 36–37.

50 Castro, “Roteiro do Mar Roxo,” 371.

first voyage of Vasco da Gama is a clear example. The fleet was running through unknown regions and passing coasts and islands about whose populations the crew was completely ignorant. The text notes that on one occasion

the navigators who accompanied us said that both Moors and Christians resided on this island of Mombasa, that they lived separately from one another, each of them had their own Lord, and that upon our arrival here, they would receive us with much honor and take us to their houses.⁵¹

Narratives and chronicles also tell of episodes where non-navigational information was provided. Some repeat what had been written first in logbooks and travel accounts, for these were the kind of sources that chroniclers relied upon to write their works. Others add information on matters that were at times related to the political tensions between the Portuguese and the local rulers. João de Barros describes an instance in 1507 when captain Lourenço de Almeida sailed with an armed fleet along the western coast of India.⁵² As he was approaching the port of Chaul, he saw seven ships moving into a river towards the city. The Indian Ocean navigators on board informed the captain that the ships were coming from Ormuz, rather than the strait of Aden (*estreito de Meca*), and were probably bringing horses. *The Commentaries* also describe an episode in 1508 when a Gujarati navigator going from Arabia to India was asked whether he had seen a large *nau* passing by:

The navigator said that, being on the back of the cape, some boats of fisherman came retreating from the sea to land. They said they were running from a *nau* of Franks returning to India.⁵³

8.4. Instruments, Texts, and Charts

The last broad context is composed of cases in which Indian Ocean navigators are mentioned alongside nautical objects. A number of Portuguese sources describe episodes where navigators showed, commented on, or

51 Gama, *Em Nome de Deus*, 61.

52 Barros, *Ásia: Dos feitos que os portugueses fizeram Década Segunda*, 28.

53 Albuquerque, *Comentários do grande Afonso de Albuquerque*, 1: Parte I e II:252.

owned instruments, rutters, and/or nautical charts. This section will discuss each one of these three individually.

8.4.1. *Instruments*

The instrument that is most often mentioned is the “Indian board” or the “*balestilha* of the Moor.”⁵⁴ It consisted of a wooden board with a string attached in the middle. One of the tips of this string was fixed to the board, the rest was marked by knots placed at specific distances. Navigators would use this instrument to measure the altitude of stars at night. They would grab one of the knots with their teeth and hold the Indian board with one hand and their arm outstretched. The lower side of the board would then be aligned with the horizon, and its lateral side held very close to the star that was to be measured.

This instrument appears in various texts, and the most technical ones refer to it in isolation, without allusion to navigators. Seafaring manuals of the sixteenth century typically instructed readers on its use. The manual written by navigator André Pires in 1520 adds a list of latitudes for places measured with such an instrument. This section, entitled “The Reckoning by the *Bastilha* of the Moor,”⁵⁵ provides measurements of seven places along the Indian coast taken with the board held upright, and of five places near the Arabian coast with the board held horizontally. All the figures displayed in this section are graduated in fingers (*polegadas*) rather than degrees, which was common practice in European navigation. While giving attention to their instruments, the Indian Ocean navigators themselves are largely absent in such texts.

Passages referring to navigators and their instruments are more prevalent in logbooks and narratives. A famous example is the journal of the voyage of Vasco da Gama, noting that the ships in Mozambique carried compasses (Genoese needles) and quadrants on board, or the passage where João de Barros described the conversation between Vasco da Gama and the celebrated navigator who was to lead his fleet to India.⁵⁶

54 Examples of this are: João Faras, “Carta de Mestre João a El Rey D. Manuel I” (May 1, 1500), *Corpo Cronológico*, Parte III, mc. 2, n.º 2, Arquivo Nacional da Torre do Tombo, <https://digitarq.arquivos.pt/details?id=3813442>. The instrument is generally called *kamal*, but this term never appears in the sources. For details on this, check: Nicolàs De Hilster, *Navigation on Wood: Wooden Navigational Instruments 1590–1731; an Analysis of Early Modern Western Instruments for Celestial Navigation, Their Origins, Mathematical Concepts and Accuracies* (Castricum: Nicolàs de Hilster, along the water at the sundials, 2018), 129–139.

55 André Pires, *O livro de Marinharia de André Pires*, ed. Luís de Albuquerque (Lisboa: Junta de Investigações do Ultramar-Agrupamento de Estudos de Cartografia Antiga, 1963), 217.

56 Gama, *Em Nome de Deus*, 53.

As Vasco da Gama showed him the great wooden astrolabe he was bringing and other pieces of metal by which he measured the altitude of the sun, the Moor was not surprised. He said that some navigators of the Red Sea used metal instruments of a triangular shape and quadrants to measure the altitude of the sun also, but mainly that of the star which served them better for navigating. Yet, the navigation that he, the sailors of Khambhat, and of all India followed was through certain stars of the north, south, and other bright ones that crossed the sky from east to west. He did not measure his distance by means of instruments similar to those, but by another one that suited him well. The instrument he brought to show him [i.e., Vasco da Gama] right away was of three wooden boards.⁵⁷

The three wooden boards are indeed the instrument that is most frequently mentioned in Indian Ocean navigational sources. Arabs call it *khashaba*, which literally means a piece of wood. The description by João de Barros agrees with the information provided in the *Kitāb al-Fawā'id* in the sense that it also mentions three boards of small, medium, and larger sizes.⁵⁸ The passages from João de Barros and André Pires combined follow Ibn Mājid and Sulaymān al-Mahrī in two other aspects. One is the fact that the instrument was most often used in relation to the stars; Arab navigational texts never seem to mention latitude measurements by means of the sun. The other concerned the basic units of measurement. Sailors of the Indian Ocean used the finger (*iṣbaʿ*), and had most likely been doing so since antiquity. This was an ancient concept originally defined as the width of a finger seen at the distance of an outstretched arm. The *khashaba* eventually standardized this metric, but there was no single precise figure in the sixteenth century for this unit. Ibn Mājid and al-Mahrī define it in their works as being around 1.54°. ⁵⁹ The salient disparity between the Portuguese and Arabic descriptions pertains to the vertical and horizontal

57 Barros, *Da Asia: Década Primeira*, 1:320.

58 For the Arabic edition, see Ibn Mājid, *Arab Nautical Sciences*, II:60; see also Gerald Randall Tibbetts, *Arab Navigation in the Indian Ocean before the Coming of the Portuguese: Being a Translation of Kitāb al-fawaid fi usul al-bahr wa'l-qawa'id of Ahmad b. Majid al-Najdi* (London: Royal Asiatic Society of Great Britain and Ireland, 1971), 93; or Abdulrahman Al Salimi and Eric Staples, *A Maritime Lexicon: Arabic Nautical Terminology in the Indian Ocean*, Studies on Ibadism and Oman 11 (Hildesheim: Georg Olms Verlag, 2019), 398–399 (for English translations).

59 For more on the finger as a nautical unit of measurement, see Hasan Salih Shihab, "Stellar Navigation of the Arabs," in *The Principles of Arab Navigation*, ed. Anthony R. Constable and William Facey (London: Arabian Publishing, 2012), 21–34.

measurements noted in the seafaring manual of André Pires—such information appears in no local text. What Sulaymān al-Mahrī does add is that sailors of various parts of the Indian Ocean used similar instruments whose sizes could vary: some would be smaller, others bigger. He believed this explained why the figures measured by Arabs, Indians, and Cholas sometimes differed.⁶⁰

The second instrument that was mentioned briefly in the logbook of the voyage of Vasco da Gama is the compass, referred to in the Arab nautical texts only in scattered passages. It is known to have consisted of a circular piece of cardboard, a magnetized needle, and a box, but whether it contained water or was dry, and when and how it was assembled, is not specified. Al-Mahrī only stresses that every navigator should know how to use it.⁶¹ The cardboard would most likely include a representation of the nautical rhumbs, which are frequently discussed in Arab texts, sometimes with entire chapters being dedicated to them. Indian Ocean navigation practice had the particular feature of relying on a stellar compass rose, which was based on the rising and setting positions of fifteen stars: Polaris would indicate the north; the places where the stars would rise over the horizon would mark the eastern rhumbs; and the sites where they would set established the western rhumbs. The rising and setting of Capella marked north east and north west respectively, for example. The Portuguese sources appear to be silent about this system.

8.4.2. *Texts*

Unlike instruments, specific texts were rarely reported by the Portuguese. The most striking example is given in the context of the violent conflict in Socotra in 1507 mentioned above. The narratives *Asia*⁶² and the *Commentaries*⁶³ tell that Tristão da Cunha (ca. 1460–ca. 1540), the viceroy of the Portuguese Indies, and Afonso de Albuquerque had just finished attacking a fortress. The old navigator whose life had been spared was said to have given Albuquerque a rutter “of all those places in the kingdom of Ormuz,” made by another navigator called Omar. *The Commentaries* then mentions the rutter repeatedly during the expedition to Ormuz in 1507. When Albuquerque

60 Sulaymān al-Mahrī, “Tuḥfat Al-Fuḥūl Fi Tamhīd al-Uṣūl,” in *Muṣannafāt Sulaymān Ibn Aḥmad Ibn Sulaymān Al-Mahrī*, ed. Ibrahim Khoury, Al-‘Ulūm al-Baḥriyah ‘inda al-‘Arab 1 (Damascus: Maṭbū‘āt majma‘ lil-lughah al-‘arabiyah bi-Dimashq, 1972), 3:28.

61 al-Mahrī, *Arab Nautical Sciences*, I:27.

62 Barros, *Da Asia: Década Segunda*, 2:228.

63 Albuquerque, *Comentários do grande Afonso de Albuquerque*, 1: Parte I e II:51.

started to fear that his local navigators were bypassing important lands on the coast of Oman, he warned them that the rutter made by Omar marked all the places along the coast.⁶⁴ There is no indication that this specific text has survived, nor is its author known by modern scholars. What is plausible is that the rutter was part of the same textual tradition to which the works of Ibn Mājid and Sulaymān al-Mahrī belong.

8.4.3. *Charts*

The most enigmatic passages referring to nautical objects are those concerning charts. The mystery here is related to the fact that charts of the Indian Ocean, that is, charts carried and produced by Indian Ocean sailors, are only mentioned in Portuguese sources. No such chart has survived to this day, and neither are they referred to in the texts of Ibn Mājid and Sulaymān al-Mahrī. The question of what these charts might have looked like remains open and scholars such as Avelino Teixeira da Mota,⁶⁵ Luís de Albuquerque,⁶⁶ and Gerald Randall Tibbetts have speculated on this.⁶⁷

Nautical texts most often mention charts of the Indian Ocean to highlight technical information they contained. The seafaring manual by André Pires, for example, includes a small rule on how to convert their units into those of the Portuguese:

if you happen to find any chart of the Moors and want to graduate it to our usage, you shall take five fingers and divide them into eight parts which are eight degrees. That way, you shall have a chart graduated to our usage.⁶⁸

Portuguese nautical charts do not directly reference charts produced in the Indian Ocean, but may offer some clues. A good example is the one produced by Jorge Reinel in 1510, which depicts “the highly populated and noble city of Malaka, the one which is not yet known nor discovered by us.” Admitting that the Portuguese had never set foot on the island, the chart

64 Albuquerque, *Comentários do grande Afonso de Albuquerque*, 1: Parte I e II:85.

65 Avelino Teixeira da Mota, *Méthodes de navigation et cartographie nautique dans l'Océan indien avant le XVI siècle*, Separata de Studia 11 (Lisboa: Junta de Investigações do Ultramar, 1963).

66 Pires, *O livro de marinharia de André Pires*, 135.

67 Gerald Randall Tibbetts, “The Role of Charts in Islamic Navigation in the Indian Ocean,” in *The History of Cartography*, vol. 2, *Cartography in the Traditional Islamic and South Asian Societies* (Chicago: University of Chicago Press, 1992), 256–262.

68 Pires, *O livro de marinharia de André Pires*, 220.

provides no additional information on how the cartographer had been able to depict it in the way he did, or place it in its position.

The *Suma oriental* by Tomé Pires also invokes nautical charts “of the Moors” in a brief account of the Banda Islands in Indonesia. The relevant passage is in a short paragraph describing where they begin, how to navigate the island of Ambon from its inner and outer sides, and then a list of its ports. Tomé Pires then acknowledges, at the end, that he did not experience this information first-hand:

If, talking about these islands close to Banda, I am far from what the navigators say I am not to blame, because I rely in this matter on those who have been there. I know it from Moors, from their charts, which I have seen many times. If their charts were organized by way of rhumbs, this [information] would have been plain. This [information here] being to read and not to chart, etc.⁶⁹

The remaining allusions to nautical charts all seem to belong to personal correspondence, logbooks, or narratives. The logbook of the voyage of Vasco da Gama claims that the ships found in Mozambique carried charts on board, along with the compasses and quadrants mentioned above.⁷⁰ João de Castro states that he consulted them at least twice, in two separate letters addressed to King João III. The first one was sent to the king⁷¹ and his brother Prince Luís⁷² in 1539 in two similar versions. They were dispatched as part of a reply to an inquiry on the opinion of João de Castro about building a fortress in the strait of Aden. The aim would be to stop Turkish fleets from entering the Indian Ocean through the Red Sea. João de Castro explains that he wondered about the distance from the island in the strait to the coasts of Ethiopia and the Arabian Peninsula, in order to determine how easily galleons would be able to sail through, and whether a fortress would be of any use. “In none of these things,” as he writes to Prince Luís:

Have I found a man who would agree with another. I would thus not engage in such an enormous construction based on what they say. One should not even venture to waste time speaking about these matters. I, my lord, was diligent to know the truth about this plan and called Arabian,

⁶⁹ Pires, *Suma oriental*, 225.

⁷⁰ Gama, *Em Nome de Deus*, 53.

⁷¹ Castro, *Obras completas de D. João de Castro*, 3:20.

⁷² Castro, *Obras completas de D. João de Castro*, 3:15.

Gujarati, and Malabar navigators who have brought me their nautical charts. The information I have taken from them was that from this island to the land of the Arabs there is more than half a league, and that all this space is shallow; and from this island to the land of the Abyssinian, in which there are four leagues, there are deep channels through which galleons can easily sail.⁷³

João de Castro first resorted to Portuguese men as he tried to determine the precise distances in the strait but found no satisfactory answer. He then discussed the matter with Indian Ocean navigators, looked at their charts, and realized the channels there were wide and deep enough for Turkish galleons to cross, irrespective of any fortress. “My say”—João de Castro concluded—“is that this should be built under no circumstance.”⁷⁴

A similar situation occurred in 1541. This time, João de Castro was writing to the king about the longitude of the Molucca islands.⁷⁵ It had been years by then since the rulers of Portugal and Spain had begun arguing on the exact location of the anti-meridian of Tordesillas, in order to define where each empire was authorized to trade and navigate. João de Castro commented in his letter that the information provided by Portuguese navigators and their nautical charts was incorrect, as it pushed the islands 185 leagues to the east. The problem, he claimed, was that the size of the Red Sea was so enlarged that Alexandria was depicted as being 600 leagues apart from Bab al-Mandab, separating the meridians of the two regions by an additional 28 degrees. To prove that this was a mistake and propose a more suitable solution, João de Castro quoted the geographical information of ancient authors such as Ptolemy and Pliny. “But,” the letter goes on,

why do I want to content myself with such antiquities, and prove with scriptures the position of places, the latitudes of lands and the longitudes of coasts over which the captains of Your Majesty have triumphed and submitted under your royal crown? Because of this, I believe that one will not find a Portuguese who does not have true information about this Gulf [i.e., the Red Sea]; either by the intense practice that they have in it, or by the charts of the Moors who are its natives —charts which make this Gulf a little bit over 300 leagues in length.⁷⁶

73 Castro, *Obras completas de D. João de Castro*, 3:19.

74 Castro, *Obras completas de D. João de Castro*, 3:21.

75 Castro, *Obras completas de D. João de Castro*, 3:41.

76 Castro, *Obras completas de D. João de Castro*, 3:44.

All sources considered, the conclusion was that the distance from Alexandria to Bab-el-Mandeb would be a little more than 400 leagues, and that the difference between the meridians of these two places would be 17 degrees—"eleven degrees less than the charts and navigators [of Your Majesty] have."⁷⁷ This was the second time João de Castro not only claimed to have seen nautical charts produced by Indian Ocean navigators, but commented on the accuracy of their values, which he preferred over those of the Portuguese.

João de Barros also mentions nautical charts. His work *Asia* in fact provides the most extensive description of the chart that was shown to Vasco da Gama on his first voyage to India.⁷⁸ The navigator found in Malindi was said to have shown the instruments mentioned above, but also

a chart of all the coast of India, with the bearings laid down after the manner of the Moors, which was with meridians and parallels very small [or close together], without other bearings of the compass; because, as the squares of those meridians and parallels were very small, the coast was laid down by those two bearings of north and south, and east and west, with great certainty, without that multiplication of bearings of the points of the compass usual in our [Portuguese] maps, which serves as the root of the others.⁷⁹

The passage agrees with the description of Tomé Pires above, in that both observe that these indigenous charts did not include rhumb lines. The claim that they were organized by meridians and parallels is, however, problematic. There is no record that sailors of the Indian Ocean would have known how to determine longitude at sea in a way that was useful to navigation. Indeed, longitude was given little attention in Arab navigational treatises, nor was it a focus in their Portuguese textual counterparts, because it was not necessary for sailing. Tibbetts has suggested that these charts "could only have been of academic or popular interest"⁸⁰ and not useful to navigation, since there is no record of any surviving Arabic maps with grids based on any practical projection. The ones that did survive are generally inaccurate and were therefore unable to assist navigators at sea.

⁷⁷ Castro, *Obras completas de D. João de Castro*, 3:44.

⁷⁸ Barros, *Da Asia: Década Primeira*, 1:319.

⁷⁹ Tibbetts's translation: Tibbetts, "The Role of Charts in Islamic Navigation in the Indian Ocean," 256.

⁸⁰ Tibbetts, "The Role of Charts in Islamic Navigation in the Indian Ocean," 259.

In contrast, the charts mentioned in other Portuguese sources had to have been useful. João de Barros described one that was shown to Vasco da Gama, but the references by Tomé Pires, André Pires, and João de Castro go into more detail. The extent to which these indigenous charts were similar to the Portuguese cartography of the same period remains an open question. The fact that they were called “charts,” together with the instruction by André Pires on converting units, suggest that they were somewhat equivalent, but how? Is it possible that they were less visual and more like the written accounts of Aḥmad ibn Mājid and Sulaymān al-Mahrī? Would this explain the fact that the two Arab authors never mention them as *charts*, or that the Portuguese report very few indigenous rutters? Clarifying such terminological issues may provide fruitful insights for both the history of knowledge exchange, and of Indian Ocean navigation.

Conclusion

The story of the navigator who led Vasco da Gama to India was no isolated event. Pilots from various parts of the Indian Ocean were often sought during the sixteenth century for help carrying out sea voyages. This chapter has tried to give a sense of the frequency with which these episodes occurred. The focus here has mainly been on the first half of the sixteenth century, but it is likely that such a study could be extended to the second. Vasco da Gama needed someone to guide him in 1498 to India, and Jan Huygen van Linschoten noted that a century later, in 1598, Portuguese ships were still taking local sailors on board.⁸¹ There was no direct instruction from the state telling sailors to seek these men. What existed were instructions in some rutters and seafaring manuals advising that certain areas should not be crossed without local navigators.

The main source here has been a corpus of Portuguese maritime literature of the sixteenth century, ranging from technical rutters and seafaring instructions to narratives and personal correspondence, enriched by and checked against relevant extant Arab texts. In all the Portuguese documents cited, Muslim or Indian Ocean navigators are referenced in one of four

81 Jan Huygen van Linschoten wrote in his 1596 *Itinerario* that “These Abexiis, and Arabians such as are free doe serve in all India for saylers and seafaring men with such merchants as sail from Goa to China, Japon, Bengala, Malaca, Ormus and all the Oriental coast: for that they have no other saylers [...]” – in John Huyghen van Linschoten, *The Voyage of John Huyhen van Linschoten to the East Indies: From the Old English Translation of 1598: The First Book, Containing His Description of the East*, ed. Arthur Coke Burnell (London: The Hakluyt Society, 1885), 1:266.

contexts: guidance, conflict, general information, or instruments, texts, and charts.

The division of such contacts into these four broad contexts, assessed individually, has allowed for the clarification of three main issues: the conditions under which navigators of the Indian Ocean were sought throughout the sixteenth century; the kind of information that was being shared; and the general attitude of Portuguese sailors towards the knowledge coming from these navigators.

Regarding the first of these issues, it is notable that the number of passages commenting on Indian Ocean navigators seems to decrease somewhat as the century progresses. This may be because the Portuguese were becoming more familiar with the techniques of sailing the Indian Ocean, or because local navigators were already on board by the time they were first mentioned in these sources. This latter case occurs, for instance, in descriptions of the voyages of Afonso de Albuquerque in 1507, of Francisco Rodrigues in 1514, and of João de Castro in 1541. It could be that over time, quests for these navigators became commonplace so that they were longer worth noting.

When Indian Ocean navigators were enlisted to lead a ship, they were generally, if not always, accompanied by their Portuguese counterparts. The rutter by Francisco Rodrigues describes an example of this, as do the works of Afonso de Albuquerque and João de Castro, which claim that joint inquiries were made of both Portuguese and indigenous navigators on certain occasions. When consulted for technical information, navigators of the Indian Ocean would sometimes discuss their opinions directly with captains, such as João de Castro, who later became viceroy. The conditions in which these navigators were queried varied significantly. Some sources describe events marked by conflict, where navigators were taken by force after violent attacks on cities and ships, or against their will. Other sources claim the navigators were provided by local rulers, or hired by Portuguese captains.

With respect to the second major issue this chapter has addressed (the kind of information being shared in the encounters of navigators), the analysis of Portuguese maritime literature has been highlighted as a productive way forward. The passages discussed here have not been treated in depth, but the overview provided permits some generalizations. Seafaring manuals, rutters, and charts tend to record more precise and pragmatic aspects—be it the right path to reach a certain land, the crossing of a particular region, the location of a place, a measured distance, the geographical features of a certain route, or the right time of departure. Geographical accounts such as that of Duarte Barbosa or Tomé Pires refer more often to places where these

navigators sailed, or to others that should not be crossed without them. All the above documents allude at some point to the fact that local expertise was required to navigate specific places. Logbooks and descriptions of voyages sometimes add content to this information that was not strictly navigational (e.g., the habits of people living in a certain place or the affairs of local ships). Rutters may include non-navigational informational as well, although this was generally not the case. Narratives and chronicles sometimes refer, albeit very briefly, to knowledge shared by Indian Ocean navigators. The description that Diogo de Couto wrote on the voyage of João de Castro to the Red Sea refers to indigenous navigators only once; the rutter documenting the same voyage mentions them several times, at different stages.

But narratives at times do the exact opposite, as in the well-developed description of the objects shown to Vasco da Gama by the navigator he met in Malindi (the *khashaba*, and a chart). While the discussion of the *khashaba* largely aligns with those found in Arab nautical texts of the fifteenth and sixteenth centuries, the account of the chart shown to Vasco da Gama (also detailed in *Asia*) is somewhat problematic. On the one hand, this chart, with its lack of rhumb lines, largely matches the sort of representation that Tomé Pires claimed to have seen several times. On the other hand, the statement that the Indian Ocean chart included meridians lines would seem to imply that knowledge of longitudes was required for navigational practice, which is extremely unlikely.

To sum up, Portuguese maritime literature testifies to the circulation of information on the following topics: navigation, geography, astronomy, nautical instruments, charts, rutters, toponymy, the populations of specific lands, the affairs of certain ships, and trade. This list undoubtedly only captures a fragment of the knowledge being exchanged between navigators, much of which would have been transmitted orally or tacitly (through demonstration) during voyages. Sailors were not writers, most of them were hardly concerned with authorship, and they often limited themselves to describing only what was demanded of them. The way a certain skill was attained or knowledge was acquired is rarely specified.

The final issue taken up in this chapter is the general attitude that Portuguese sailors had towards the knowledge shared by Indian Ocean navigators. The descriptions of political events, narrations of wars, and the imperialistic tone used by most Portuguese authors of the time give a sense of the socio-political background behind the oceanic voyages that were performed by navigators. The Portuguese in general espoused a prejudicial opinion of Muslims that had originated during the centuries of tensions and

conflicts between the Iberian Peninsula and the North African countries. Most Portuguese maritime literature of the time is thus filled with and shaped by biases aimed at transmitting an idea of Christian superiority (characteristic of European works of the time). The peculiarity of the textual passages examined here is that such a sense of superiority—if felt at all—is much diminished with respect to Muslim navigators. Regardless of the way navigators of the Indian Ocean were personally treated on board, it is largely assumed that they carried valuable knowledge that resulted from years of experience and generations of improvement. Indeed, when ships guided by such navigators got lost, it was often implied that the navigators had done this on purpose. Francisco Rodrigues claimed that his navigator “worked hard” (*trabalhou por isso*) to deviate him from the route; João de Barros, wrote that the name of the Ilha do Açoutado (“Island of the Flogged-one”) was due to a *lie* told by the navigator; Afonso de Albuquerque was afraid that his navigators were tricking him into missing important ports on the coast of Oman. There are exceptions, of course. The description of the expedition led by Albuquerque to Hormuz mentions an embarrassing episode for the navigators he had brought from Malindi. They had been unable to give the name of a certain land near Oman, and a navigator from Socotra stepped in and supplied the desired information to the captain (identifying it correctly as Orfanão). This and similar examples are rare, nonetheless. The general rule that emerges in these sources is that the navigators of the Indian Ocean were regarded as experts, and at times even quoted as authorities. Francisco Rodrigues justified the decisions made during most of his voyage to the Dahlak Islands as being by the order (*por mandado*) of the Arab navigator; Tomé Pires verified his information on the Banda Islands by consulting the “charts of the Moors”; the possession of an Arabic rutter gave Afonso de Albuquerque the confidence to feel that his navigators would not trick him; and then there was João de Castro. Just like Francisco Rodrigues, this captain based some of the decisions recorded in his “Rutter of the Red Sea” on the advice of Arab navigators. Moreover, in his answers to questions from the king, the captain bolstered his opinions by citing Indian Ocean navigators—even when these views conflicted with those of Portuguese sailors.

To conclude, this chapter has argued for the relevance of Portuguese maritime literature in the study of circulation of knowledge in the sixteenth-century Indian Ocean. Rather than looking at documents individually, it has tried to examine them collectively, according to the contexts in which Indian Ocean navigators are mentioned. Further study and analysis of Indian Ocean sources will be an essential next step, allowing a more complete picture of this complex topic to be developed. Portuguese documents, for example,

reveal very little information regarding the motives that navigators and local communities had in coping with the same Europeans who created political conflicts. Another question that needs clarification is the information that Indian Ocean sailors might have learned throughout these voyages, as well as the perception that they had of Atlantic navigation techniques. The circulation of knowledge is multifaceted, and much remains to be explored. This chapter hopes to have contributed to the clarification of some of its aspects through the case of Iberian and Indian Ocean navigational practices, and it hopes to have shown that the in-depth assessment of a group of sources from one side may help raise questions and provide technical details on the other.

Acknowledgements

I would like to express my gratitude to everyone who has helped me to shape this paper into its final version. A sincere thank you to all members of the ERC RUTTER project, particularly to Henrique Leitão and Juan Acevedo, who have been supervising my work, to Luana Giurgevich and Nuno Villa-Santa for their advice on technical questions, and to Šima Krtalic for her English revision. I would also like to note that a version of this paper was presented at the Aga Khan University in London, where it received constructive feedback which has led me to reflect on certain ideas and improve what I had written. I am grateful to Leif Stenberg for his invitation and to everyone who attended the meeting. This chapter is part of a research project that has received financial support from the Fundação para a Ciência e a Tecnologia, I.P./MCTES through Portuguese national funds (PIDDAC).

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9. The Poetics of Distance in the Early Modern European Imaginary

Joana Lima

Abstract: Portuguese blue water literature reconceptualized space, while creating the notion of a global world. Astonishingly cartographical, poetry, theater, and prose written in sixteenth-century Portugal trace a fresh consciousness of scientific and technological domain over long-distance navigation, thus, the globe. Wonderous and realistic tales about safely accessing what was remote, by portraying novel vocabulary ways to convey distance and reckoning the effect that faraway events have in local reality, inscribed an emerging and collective mental story in Europe based in the lived experience at sea. A story about having no fear of sailing to the end of the world and then returning, a story of believing that *if there was more world, they would get there*.

Keywords: production of space, planetary distance, oceanic globe, reconceptualization of the *orbis terrarum*, mental cartography, literary archive

Introduction

With a splash of science and a spritz of novelty, the voices coming from the ocean sprayed a refreshing notion of the globe in sixteenth-century Europe: that the world is no longer enough. What had been perceived until then as an *orbis terrarum*, a planet made of Europe, Africa, and Asia, together with absolutely inaccessible areas, is suddenly small enough for a new human aspiration—to travel across it. Blue is the color of this desire, spread on land by Portuguese and Spanish crews returning from oceanic long-distance voyages around the Earth. The sound of the seven seas—that is, the conversations that happened on board, necessarily involving

technical, technological, and scientific concepts —showered Iberian courts with sophisticated notions arising from scientific and technical practices at sea, such as a new perception of planetary distance, which soon started percolating through the public discourse. Subtly, as ocean spume is blown to the sand. To hold these delicate traces of the sea on the shore, to understand this process of knowledge transference from daily life in the ships to the common conversation of non-specialized people on land, to approach what the *vox populi* said about distance when, for the first time, humankind experiences the Earth on a global scale, one must choose tools suited to a story written not in traditional historical documents, but in the imagination of the people who lived it. For a subtle story, subtle historiographical tools.

To enter this elusive realm, sixteenth-century Portuguese literature seems to be key, given how early it starts portraying and recreating life in long-distance oceanic voyages, and how it brims with nautical, cartographical, and astronomical terms; the reflex of a society very familiar with the oceanic enterprise, and which drops wind roses, nautical charts, calculations of latitude, seamanship maneuvers, constellations, and oceanic routes into this corpus and the imaginary of those in contact with it. Forming part of the artifacts that disrupted medieval European metageography¹—the set of narrative structures by which Europeans had hitherto organized their knowledge about the world, such as theater, poetry, cartography or painting—, this blue water literature seems to describe the globe in a cartographically new way, while reconceptualizing planetary space, following the experiential observation of a new geography of the Earth in the context of oceanic voyages. A new world, demanding a far broader stage, is designed by these texts. Their scope is no longer European but planetary, forever changing the cosmological and cartographical notions of what Earth is for their very diverse audiences. However challenging it is to grasp the impact of such a profound existential transformation on the life of an individual (capable of traveling the entire world once transoceanic voyages became stable, routine, and safe), it is possible to trace this process through a close comparative reading of fifteenth- and sixteenth-century Portuguese poetry, theater, and chronicles about territory and voyages.

1 On the concept of *metageography*, developed by Edmundo O’Gorman and Ricardo Padrón, see Ricardo Padrón, *The Spacious Word: Cartography, Literature, and Empire in Early Modern Spain* (Chicago, IL: University of Chicago Press, 2004).

9.1. A New Gaze, from the Heavens to the Waters

A starting point for a brief itinerary through this cosmological and existential transformation based on the perception of distance may be a late fifteenth-century courtier poem, “De Duarte de Brito em que conta o que a ele e a outro lh’aconteceo com ãu roussinol e mutas coisas que vio” (“By Duarte de Brito in which he tells what happened to him and a friend with a nightingale and many things that he saw”), compiled by the Portuguese poet, chronicler and editor Garcia de Resende (1470–1536) in the poetic anthology *Cancioneiro Geral* (1516):

Through amazing paths,
we crossed so many deserts
that we fearfully found ourselves
doubtful of our lives
and certain of our deaths.
Sad and faraway,
due to the long-distance
of very strange lands,
we found ourselves divested of us,
and tired in the high lands
and mountains.²

This poem³ is deeply inspired by the *Inferno* (ca. 1304) of the *Divine Comedy*⁴ by Dante Alighieri (1265–1321), via *El Infierno de los Enamorados*,⁵ by Íñigo López de Mendoza, the marquis of Santillana (1398–1458). In this tale of two friends traveling by foot across mountains and valleys, losing their way in remote lands and even in Hell, we are at the ground zero of the spatial revolution—the poem bears the stamp of the medieval itinerary and its gaze

2 Original text: “Per caminhos espantosos / passámos tantos desertos / que nos vimos temerosos / ser das vidas dovidosos / e de nossas mortes certos. / Onde tristes, alongados, / per longa estancia de terras / mui estranhas, / nos vimos de nós roubados, / cansados nas altas serras / e montanhas.” See Garcia de Resende, “De Duarte de Brito em que conta o que a ele e a outro lh’aconteceo com ãu roussinol e mutas coisas que vio,” *Cancioneiro Geral de Garcia de Resende* (Maia: Imprensa Nacional-Casa da Moeda, 1990), 1:316.

3 I have translated all literary sources presented in this paper, originally published in Portuguese, given that the great majority of them have not yet been translated into English.

4 Dante Alighieri, *A Divina Comédia*, trad. Vasco Graça Moura. Edição bilingue (Lisboa: Bertrand Editora, 2006).

5 Marqués de Santillana, Íñigo López de Mendoza. *Obras completas* (Madrid: Fundación José Antonio de Castro, 2002).

on the world, the universe, and distance. Long-distance is presented as a synonym for the fear of death, for self-doubt, sadness, remoteness, loneliness, tiredness, and even depersonalization: the typical emotions of one living in an *orbis terrarum*, closed in upon itself and forbidding travel to the end of the world. Given the feelings of uneasiness caused by being in remote places (linked closely with a lack of technical and scientific control over nature), Duarte de Brito constructs a great part of the itinerary in this poem looking away from the Earth, placing his gaze on the heavens, its celestial bodies and constellations. As in other parts of the poem, which will not be quoted here given their length, the movement of the sun, Mercury, Venus, the moon, Mars, Jupiter, and Saturn, as well as the twelve constellations of the Zodiac seem to be much more familiar to the poet than traveling across the globe, making him look up to the stars, and placing him in a powerless position on Earth.

The world depicted here is that of the Aristotelian-Ptolemaic-Christian cosmological model, according to which the universe had a beginning and would have an end. De Brito's world, drawn from *On the Heavens*⁶ by Aristotle, follows a representation of the universe made of two concentric zones—first, the celestial zone, which contained the orbits of the Empyrean, the first motor, the crystalline, the firmament, and the seven planets; then, the sublunar zone, made of corruption, which contained the four elements of matter (fire, air, water, and earth, in that order), and was therefore divided into four concentric zones (the last being the infernal, with the heavier mass of matter; that is, the Earth). De Brito's world is thus one in which the Earth is the lowest place in an absolutely finite universe, where all living bodies are destined to perish, and must content themselves with gazing at the stars.

Oddly enough, the observation of this dark stellar canopy, when applied to oceanic sailing—that is, the astronomical navigation that allowed for early modern Iberian long-distance voyages—seems to have been the twist that allowed for humankind to move from the sense of a finite universe to an infinite one, and to start feeling more at home in the world. It is possible to grasp the exact moment of awe (with all the dread and wonder it encompassed), when human pupils dilated at the same time global space did, in “Como elrey dō Mannuel depois que Pedrálvarez Cabrál veo da India por razam deste descobrimento & cõquista della, tomou o titulo que óra tem a coróa deste reyno de Portugal, & a razam & causas delle” (“How King Manuel I after Pedro Álvares Cabral came back from Brazil due to its discovery & conquest, took the title that now has the crown of this kingdom of Portugal, & the reason & causes of it”), a passage of *Décadas da*

6 Aristotle, *On the Heavens*, Loeb Classical Library (London: Heinemann, 1939).

Ásia I ("Decades of Asia" I) (1552). In this passage, the Portuguese chronicler João de Barros (1496–1570), working at Casa da Índia⁷ in sixteenth-century Lisbon, describes the reaction of the advisors of King Manuel I of Portugal (1469–1521) to a nautical chart created after the oceanic voyage that led to the finding of Brazil (1500) by the Portuguese navigator Pedro Álvares Cabral (ca. 1450–ca. 1520):

And in their minds, which saw only in the nautical chart such a large coast of painted land, and so many directions, that it seemed that our ships circled the known world twice, by entering the path of another world we wanted to discover, such a disquieting image began being painted that their judgment became haunted. And if this painting created reluctance at sight [...], how would a prudent man not lament in his regard, seeing that this kingdom [...] carried on its shoulders the obligation of a world, not painted, but true, which could bend him with the great weight of the earth, the sea, the wind, the burning sun it contained, and, what is more serious and burdensome than these elements, the variety of so many people who inhabited it.⁸

As they absorbed the lines and hues of this map of a New World in the South Atlantic, a globe double the size that advisors (and ancient scholars, basing

7 The Casa da Índia, founded in Lisbon circa 1503 by King Manuel I of Portugal under the designation Casa da Guiné, da Mina e da Índia, is the most important economic Portuguese institution in the sixteenth century. It was there that all the commercial, administrative, and financial aspects of the Portuguese maritime expansion were managed, as it served both as customs, trading post, accounting office, post office, and central archive of the voyages, were the Padrão Real map was created, updated, kept, and from which all the official Portuguese nautical charts were copied. For more detailed information on the Casa da Índia, see *Regimento das Casas das Índias e Mina* (Coimbra: ed. Damião Peres, 1948); Avelino Teixeira da Mota, *Alguns aspectos da colonização e do comércio marítimo dos portugueses na África Ocidental nos séculos XV e XVI* (Lisboa: Junta de Investigações Científicas do Ultramar, 1976); and Luís de Albuquerque, *Dicionário de história dos descobrimentos portugueses* (Lisboa: Círculo de Leitores, 1994), 1:517–520.

8 Original text: "E ajnda a muytos, vendo sómete na cártta de mareár hua tâ grãde cósta de térra pintada, & tâtas vóltas de rumos, q parecia rodeárem as nossas náos duas vezes o mundo sabido, por entrar no caminho doutro nóvo q queríamos descobrir: fazia nelles esta pintura hua tâ espátósa jimaginaçã, q lhe assombráva o juízo. E se esta pintura fazia nojo à vista [...], como se nã cõdoeria hum prudente homem prudente em sua consideração, ver este reino [...] tomar sobre os hõbros de sua obrigação hum mundo, nã pintádo, mas verdadeiro, q ás vezes o podia fazer acurvar cõ o grã peso da terra, do már, do vento, & ardor do sól q em sy continha: & o q éra muyto mais grãve & pesádo q estes elementos, a variédade de tantas gentes como nelle habitávã." See João de Barros, *Décadas da Ásia* (Lisboa: Imprensa Nacional-Casa da Moeda, 1992), Década I, Livro VI, Cap. 1. Fl. 68.

themselves upon Ptolemy) had imagined, took shape in their astonished minds. Their bewilderment must have been rooted in at least two major consequences of the voyage. First, the fact that the maritime voyage would shatter Ptolemaic geography (the dominant paradigm for centuries), having transcended the zones hitherto considered unreachable or uninhabited. And second, the ontological transformation that this cartographically materialized geographical discovery was about to bring. When reading this excerpt, one cannot escape the immediacy and keenness of their feeling that this nautical chart would put the weight of the world on the shoulders of the Portuguese court, all the way from Brazil. The gravity of a newfound awareness—that a profound transformation of planetary space was about to reshape the sense of self in the world—did not diminish over time. Paradoxically, this change brought a greater sense of ease with it, making those who felt it feel slightly less like they were at the very bottom of the universe.

Suddenly blue, the early sixteenth-century literary gaze descended from the night sky to the glistening ocean waters and then to the Earth. This shift was accompanied by a profound and enduring change of feelings about long-distance—a shift to embracing it, longing for it, and even pursuing it. Disrupting medieval narratives about the globe, these literary texts, inspired by written and oral descriptions of a New World, depict a continuous movement of characters across the globe in an astonishing spatial extension that was unimaginable before the Iberian transoceanic voyages. The naturalness, recurrence, stability, and security with which many literary characters, imitating real-life travelers from all Portuguese social strata, cross the oceans and the globe may have something to say about how space, long-distance, and the notion of a global world began to be perceived in early modern Iberia. Numerous references to voyages on a planetary scale are found, for instance, in Portuguese popular theater. One such example is found in a short paragraph of the *Comédia Eufrosina* (“Eufrosina Comedy”) (1555), by Portuguese playwright, courtier, and royal treasurer Jorge Ferreira de Vasconcelos (1515–1585). In this scene, a character called Zelótipo, a Portuguese nobleman living in Coimbra who plans to go to India, reads a letter by a character called Troilos de Sousa, a Portuguese resident of India. The missive, read aloud to his family in provincial Coimbra, gives news about the voyages of a certain Galaor Falcão, a Portuguese man traveling through Asia. The communication, quoted in translation below, displays the geographical extension of movement around the globe that Portuguese theater audiences, not particularly learned, were surprisingly familiar with:

Zelótipo—You shall tell to the lady who is my aunt Briolanja Soarez that her son Galaor Falcão made a trip to the islands of the Maldives where he was at great risk, but he left and went to recover in Ormuz, where he wrote to me that he is healthy. And to my lady Violante D'Ornela, the godmother of my child, say that her husband left from here (in India) to China, and that he wrote to me from Malacca saying that he had taken a profit with certain goods, and that he was following his route with determination to be here at the time of the armada leaving for those kingdoms (of Portugal), to go with the job I brought, and I think that he will arrive very rich.⁹

From Goa to the Maldives and then Ormuz, from India to China, Malacca and Portugal—a literary itinerary of places simultaneously so *exotic* and yet familiar to the commoner of sixteenth-century Portugal. The oceanic voyages mentioned by Ferreira de Vasconcelos cover massive swaths of land and sea space. This unprecedented expansion in the imagination of the Earth should have been astonishing to a public that, just half a century prior, had read De Brito's uneasiness about traveling through far-away places. This being a play presented before a community, however, it had to resonate instantly with the audience's imaginary, given the immediacy intrinsic to theater. The swiftness with which these characters traverse the globe and communicate through the written word with loved ones back home, and the ease with which this information is given in the *Comédia Eufrosina*, are therefore telling. They suggest that mid-sixteenth-century Portuguese audiences were already accustomed to the concept of long-distance traveling, the interconnection between faraway places, and thus a global world, connected by the oceans. A very understandable consequence of this is the formation of a society in which all social strata were somehow involved in the maritime expansion in some capacity. Hence Zelótipo's casual tone as he delivers an itinerary of the exotic just as if it were an itinerary of his small hometown.

What we find in the *Comédia Eufrosina*, a Renaissance play inspired by the classical structure and usual amorous subject of Roman comedies, runs contrary to the paradigm that had ruled antiquity and the Middle Ages, when

9 Original text: "Zelótipo—Direis à senhora minha tia Briolanja Soarez que seu filho Galaor Falcão fez ãa viagem às ilhas de Maldiva onde correu grande risco, porém fez fazenda e foi-se convalecer a Ormuz, donde me escreveu que está de saúde. E à senhora minha comadre Violante D'Ornela disse que seu marido partiu daqui pera a China, e de Malaca me escreveu que fezera proveito em certa mercadoria, e levava sua rota com determinação de ser aqui ao tempo da armada pera esses reinos, pera se ir com o emprego que trouxesse, e tenho pera mim que irá muito rico." See Jorge Ferreira de Vasconcelos, *Comédia Eufrosina* (Lisboa: Edições Colibri, 1998), 37.

the Earth was considered to be divided into parts, or zones, many of them unreachable. In this hybrid literary object, the traditional dramatic subject and narrative structure is revitalized by topics related to the maritime expansion, like that of characters moving at great speed and over immense distances across the globe. Here, we find a testament to a moment of transition between a classical and a modern world, with previously remote locales—such as the Maldives, Ormuz, India, China, Malacca—transformed into familiar places, if only in name. Briolanja Soares and Violante D'Ornela, noblewomen living in Coimbra who would certainly have traveled very little, nonetheless readily recognize the toponyms Zelótipo lists. This shift was enabled by the science, technology, and techniques at the basis of oceanic navigation.

It is possible to find this idea even earlier in Portuguese literature, together with the notion of nautical security and stability, which must have provided sixteenth-century people with a sense of optimism and trust in these voyages. Gil Vicente (ca. 1465–ca. 1536), the forefather of Portuguese theater, had been absorbing such concepts since the beginning of the sixteenth century. He often enjoyed the patronage of King Manuel I of Portugal, the same monarch whose advisors had been awestruck by their encounter with a world twice its previous size while gazing at Pedro Álvares Cabral's nautical chart. Immersed in the Portuguese court, Vicente's works are naturally tinged by the maritime themes imbuing the reign of Manuel I, inspiring a fair number of literary studies on topics like the aquatic imagery in his plays. What is lacking is a deeper appreciation of the subtle and sophisticated scientific notions coming from the maritime enterprise and materializing in his words, which mirror the knowledge effortlessly learned by Portuguese theater audiences in everyday life. Such an expression of confidence in science can be met in the tragicomedy *Triunfo do Inverno* ("Triumph of Winter," 1529), an allegorical tale about the celebration of Spring, where the author characterizes the difficulty of winter by using the image of a storm in the ocean:

The (Portuguese) ships are so powerful
with the grace of the heavens
that, although the sky may sink
with dangerous storms,
they go and they return without fear.¹⁰

10 Original text: "Son sus naves tan poderosas / Con la gracia de lo cielo / Que aunque se hunda el cielo / Com tormentas peligrosas / Van y vienen sin recelo." See Gil Vicente, *Triunfo do Inverno* (Lisboa: Imprensa Nacional, 1933), 19.

In shipbuilding and technology, they (the Portuguese) trusted. This, nautical astronomy, seafaring techniques, and cartography simultaneously allowed for a real broadening of the planetary space and the possibility of shortening it, rendering accessible what was previously remote and frightening, and installing human dominion over the ocean. That is, notions inconceivable only a century before. Nor were these voyages adventures: they were carefully prepared round trips, in which safety was to be achieved by the systematic training of pilots; the establishment of Portuguese administrative institutions such as the Casa da Índia (which logistically and scientifically organized these expeditions); and the creation of scientific documents such as regiments, oceanic rutters, nautical charts, and seamanship handbooks, to develop steady and stable oceanic routes like the India Run and the Brazil Run.¹¹ The complex logistical and informational system that early modern Portugal inaugurated, which allowed for the success of oceanic voyages and long-distance control of the ultramarine empire, has received comparatively little attention from historians of science (in contrast to the more comprehensive body of scholarship on the Spanish Empire).¹² These same factors made it common knowledge (even to the unlearned audiences of Gil Vicente's plays) that Portuguese ships facing bad weather in the middle of the ocean were equipped with scientific and cartographical knowledge, nautical instruments, and naval construction. Round trips could be completed—refreshingly—*without fear*.

Along with this reliance on scientific and technological control of nature came new notions of globality regarding the influence of distant phenomena on local decision-making (in order to accomplish a successful voyage). This was the case for example of the need for Portuguese pilots to master the wind cycle systems in both the Atlantic and the Indian Oceans throughout the year (both were crucial for the completion of a safe round trip between Portugal and India). To know the cycle of the Indian Ocean monsoons was to know how to decide the date on which the Portuguese ships should depart from Lisbon to India, and vice versa. Such an important decision implied understanding that remote global

11 On the early modern Portuguese institutions and practices for the organization and development of the knowledge involved in long-distance traveling, see Antonio Sánchez, "Science by *regimento*: Standardising Long-Distance Control and New Spaces of Knowledge in Early Modern Portuguese Cosmography," *Early Science and Medicine* 21, no. 2–3 (2016): 133–155, <https://doi.org/10.1163/15733823-02123p03>.

12 On this subject, see Arndt Brendecke, *Imperio e información. Funciones del saber en el dominio colonial español* (Madrid: Iberoamericana; Frankfurt: Vervuert, 2016).

events had major influences on nearby local actions, given that the date chosen to depart from Lisbon to India, usually between March and April, depended on the sailing conditions on both oceans: at this time of the year, the winds were favorable for sailing south in the Atlantic, and to arrive in time, between June and September, for the great southwest monsoon in the Indian Ocean that facilitated navigation to India. Likewise, from India to Lisbon, the return was usually between December and March (often in January), so that Portuguese ships might catch the northeast monsoon. Even though this was the pilot's decision, the knowledge derived from these nautical practices circulated more widely.

The comedy *Auto da Índia* ("The Play of India") (1509), by Gil Vicente, is a perfect example of how the consequences of remote events were inscribed in the early modern Portuguese imaginary, specifically the importance of knowing the wind circulation cycles in the oceans. A satire on the adultery perpetrated by married women living in Lisbon whose husbands had traveled to India, this play encapsulates in its two main characters—Constança, the adulterous wife waiting for her husband to return from Calicut; and Moça, her maid, a ferocious critic of Constança's infidelity—the common knowledge unlearned people, without any experience in sailing, had about these transoceanic voyages. The continuous question, always coming up in its dialogues and monologues, is the date when the deceived husband will return to Lisbon, since Constança does not have a friend in India like Troilos de Sousa from *Comédia Eufrosina*, communicating her husband's whereabouts. *Auto da Índia* is rich in references to the time and space of the India Run. Knowledge about the usual departure date from Lisbon (due to the Indian Ocean monsoons), as well as the acquaintance with the wind system in the Atlantic Ocean, shine brightly in the lexicon of the sea with which this play was written. Clearly, both courtier and unlearned audiences in Lisbon were quite aware of these natural phenomena and their consequences. For Constança to safely continue her extramarital affair without being caught by her husband, it is important that the date on which he departed to Calicut is known:

They depart from here (Lisbon) in May
When young blood starts stirring.¹³

13 Original text: "Partem em Maio daqui / Quando o sangue novo atíça." See Gil Vicente, *Auto da Índia* (Lisboa: Seara Nova, 1979), 27.

A bad omen for those sailing in the Atlantic Ocean, this metaphor about blood gives rise to the idea that the hot season begins in May, perhaps hinting at inauspicious timing for a departure to India. This awareness of the importance of meteorology for the voyage to India was related to the conditions for crossing the Cape of Good Hope, always difficult due to the strong oceanic currents contrary to the passage to the Indian Ocean and the storms that typically occur there in July, winter in the southern hemisphere. It was also associated with the route to be chosen after doubling the cape, since the date of the crossing determined the path to be followed to reach India—either sailing north, by the Island of Mozambique, where the ships could stop over before reaching Goa, Calicut, or Cochin; or sailing northeast, in open sea, through the central Indian Ocean up to India. These two route options, a consequence of the time the ships had departed from Lisbon, would necessarily imply two different types of voyage in terms of safety, possibility of hazards, and of course arrival dates at the destination. Therefore, given the weight this timing had for the human lives on board and the economic success of the kingdom, it was understandable that the audiences watching this play were familiar with such considerations. A less than perfect date (i.e., leaving May in a rush) was not unheard of,¹⁴ and may be linked to financial issues, which could lead to disastrous consequences on a voyage like the one Constança's husband was undertaking. Among other undesirable outcomes, the ship risked getting lost along the African coast, wintering in Brazil, being wrecked at the Cape of Good Hope, or having to spend a tremendous amount of time in the Indian Ocean on the way to India, thus missing the due return date to Lisbon. In Constança's view, of course, some of these exigencies would have been welcome, giving her more time to pursue her amorous affairs in Lisbon.

Despite her confidence in the delay of her husband's return to Portugal due to his late departure date from Lisbon, he does return on time. Science, technology, and technique, bypassing the obstacles of the natural world,

14 On the departure dates from Portugal to India, see Charles Boxer, *The Tragic History of the Sea 1589–1622* (Cambridge: Cambridge University Press, 1959), 7: “Most seamen thought that the first half of March was about the best time to set out on the voyage to India, but in practice the ships often left in the second half of March or in the first half of April. Departures later in April, or even early in May, were not unknown, but the ships involved almost invariably made *arribadas*, or abortive voyages, being compelled either to return to Lisbon or to ‘winter’ in Brazil. Delayed departures were chiefly due to administrative and financial difficulties at Lisbon, such as shortage of ready money when most needed, and trouble in collecting the crew.”

swiftly and safely brought him back home, even before the anticipated time of arrival, thus completing a secure round trip of the India Run:

We returned in the *volta do mar*,
 Almost, almost capsizing,
 Our Heron was flying
 As the sea was falling apart.¹⁵

The speed of sailing back to Lisbon (despite meeting a tremendous storm in the Atlantic Ocean, as the hyperbole of the sea “falling apart” suggests), reaches this *auto*’s audiences through the animation of the heron. Unexpectedly, in a time where Renaissance European literature was turning to classical antiquity for its models, lexicon, and tone, we find in Gil Vicente a taste for rhetorically playing with technology, using an elegant and fast bird (the heron) to stand in for a technological object (a Portuguese ship). This vessel does not sail, it metaphorically flies over the ocean, ploughing through its hindrances—the currents, the winds, the waves, the atmospheric phenomena—to such a point that the boat almost capsizes. The passage likewise encapsulates how knowledge of the winds could shorten great distances at sea in its use of the expression (evidently known by the audience, given the normalcy with which it is said) *volta do mar*.¹⁶ This was a nautical maneuver invented by Portuguese sailors when faced with the difficulty of sailing north near the African coast in the southern Atlantic Ocean, on their way to Lisbon. Rather than struggle against winds pushing the ship south (a feature of this part of the ocean), this sailing technique consisted of following an odd new route. Returning from India, after the crossing of the Cape of Good Hope, the pilots would steer northwest into the open Atlantic Ocean, leading the ships to the island of Saint Helena, and, after sighting the Saint Peter and Saint Paul archipelago, they continued until they reached the latitude of the Azores archipelago. From there, they could take an easy and almost straight route east from the Azores to Lisbon. A similar maneuver could be made when returning to Lisbon from the Gulf of Guinea.

15 Original text: “Fomos na volta do mar / Quasi quasi a quartelar / A nossa Garça voava / Que o mar se despedaçava.” See Vicente, *Auto da Índia*, 53.

16 On this sailing maneuver, also known as the *volta do Brasil*, *volta do mar largo*, *volta do largo*, *volta da Guiné* or *volta da Mina*, and its relation to the Atlantic and Indian ocean wind systems throughout the year, according to fifteenth- and sixteenth-century Portuguese oceanic rutters, see José Malhão Pereira, “Roteiros portugueses, séculos XVI a XVIII. Sua gênese e influência no estudo da hidrografia, da meteorologia e do magnetismo terrestre” (PhD diss., University of Lisbon, 2018).

If it were not for the nautical expertise of the pilot in this play, Constança's husband and his fellow crew members would not have been able to experience the velocity and success of the return voyage here portrayed. Despite the literary transfiguration present in the excerpt above, this is an image that was quite close to reality, since knowing the wind was decisive in safely and quickly sailing the Atlantic and following an established maritime route, the *volta do mar*. Not only are there numerous references to winds from different parts of the globe across sixteenth-century Portuguese literature, but there is also a solid awareness of distances between places and distances at sea, which is accompanied by a new lexicon of accuracy. This vocabulary reflects a fresh idea of numerical control over nature, where readers and theater audiences are given specific units of length, such as nautical leagues, and numbers, to represent the distance at which something is. In the same *Auto da Índia*, Moça, the maid, speaking ironically to Constança, states that:

If when he (your husband) goes out to fish
 Half a league into the sea,
 You know very well where he is,
 Much more do you know when he goes to Calicut.¹⁷

Again employing hyperbole, here for the sake of comedy, Gil Vicente creates a situation in which this unlearned adulterous woman is more aware of the nautical distances on the India Run than of those linked to a simple local fishing trip off the Portuguese coast. Constança understandably knows the distances “very well” to locate someone in her reality close-by, where she can possibly even see the fishing boat. However, despite having never left mainland Portugal, she knows how to do this much better when the reality is faraway, where her vision cannot help her; that is, in the blue oceanic desert, where only animals, the colors of the water, and the stars—and, of course, documents such as nautical rutters, where this information was compiled and organized—might help one find a location. Notwithstanding the hyperbole and the irony, it is not farfetched to believe that a mental cartography of these distances and locations had been very naturally inscribed in the society laughing at this Gil Vicente satire.

In fact, a sense of control over the globe, turned into an apprehensible object through the lived experience at sea and consequent narratives of this experience, seems to exist in mid-sixteenth century Portugal. Literature

17 Original text: “I se vai ele a pescar / Mea légua pelo mar / Isto bem o sabes tu / Quanto mais a Calecu.” See Vicente, *Auto da Índia*, 27.

provides us with several accounts of unlearned characters, and, subsequently, audiences, who have the distinct notion of global space and the distance between faraway places. Pedagogical texts such as the chronicle “Em que se descreve o Reyno de Sião, & alguas cousas notaveis nelle” (“Where the Kingdom of Siam is described & some remarkable things in it”) (1563), by João de Barros, add to this sense of holding the globe in the palm of one’s hand, since the author urges the reader to use his fingers to mentally measure the kingdom of Siam while learning Asian geography:

Whoever wants to receive in their mind the land of these kingdoms, turn the left hand with the palm down, and move your thumb away from the second finger, called index, and then move this one away from the next three, which you should close, and shorten it by the first knot, which is situated almost at the half of the finger, where they slightly shorten and extend. And once you have your hand like this, look at the coast of India which is situated along the outside of your thumb, and know that this is the part of the West; and at the end of it you will find Cape Comorin, which has the latitude of seven and a half degrees to the Arctic Pole. And, at the tip of the second finger of the index, which is to the East, before reaching the end of it, which is four degrees latitude to the same part, you will find the city of Malacca, which is situated at two degrees latitude.¹⁸

A brief excerpt of an extended geographical description of the Asian territory, where no figurative map is displayed, this appears to be an innovative textual way of conveying distance and of teaching the geography of remote lands to readers who probably have not yet traveled to such places. Inviting the reader to open their hand and use their fingers, this seems to be a sort of imaginary mapping, making it easy for anyone without cartographical documents but with good imagination to “receive in their mind the land of these kingdoms.” That is, to recreate their own image of the continent, under the guidance of accurate geographical information, such as latitude

18 Original text: “Quem na mente quiser receber a terra deste reyno, vire a mão esquerda com a palma pera baixo, & aparte o dedo polegar do segundo chamado index ou mostrador, & depois aparte este index dos três seguintes, os quâes çerre & encurte pelo primeiro nó que é quâsy o meyo per onde eles levemente se encurtam & estendem. E depois que tiver assi a mão, oulhe que a cósta da India lhe fica ao longo do dedo polegar da banda de fóra, e esta é a parte do ponente: & na ponta delle é o cabo Comorij que está em altura do polo artico sete grãos & meyo. E na ponta do segundo dedo index que está ao levante, ante de chegar ao fim delle que está em três quartos de grão da mesma parte: fica em dous a cidadé de Maláca.” See João de Barros, *Décadas da Ásia*, Década III, Livro II, Cap. V, fol. 36.

degrees, holding all the territory between West India and Malacca in the palm of their hand. From looking up to the stars while in foreign valleys and mountains, to looking at the sea and being able to imagine the locations on the Indian Run, to reading a book at home and using a hand to know the entire geography of Asia—from the mid-fifteenth century to the mid-sixteenth century, Portugal came a long way in unintentionally reconceptualizing planetary space.

All the narrative mechanisms presented here appear to have contributed to the dissemination of a notion of global Earth in the Portuguese imaginary, connected by the oceans. A new narrative in which the characters and the people are no longer afraid of going to the end of the world, as there is no end, and they trust in their safe return home due to the organizational, scientific, and technological aspects of the round-trip nature of oceanic voyages. This is a conceptualization quite different from that of the Middle Ages. It brims with optimism and confidence in science and technology, forming a story where the protagonists, despite maintaining the Aristotelian cosmological model as their paradigm, no longer seem to feel they are at the lowest point in the universe. On the contrary, this is a story of feeling more at home in the world, a globe they can grasp in their minds and their fingers, and a story of feeling that the whole Earth is not enough. This desire for venturing into the blue while already knowing all there is in this sub-lunar sphere can be read in *Comédia Eufrosina*, when the character Andrade, a servant of the melancholic and contemplative Zelótipo dreaming of going to India and returning a rich man, states:

Andrade—Look at my master's thoughts:
(he says that) the world is too small for him.¹⁹

A profound existential revolution is encapsulated in Zelótipo's worldview, which is hungry for the infinite, as the great spatial extension from Coimbra to India has been shortened in his imagination. The famous transoceanic voyage (and unexpected first circumnavigation of the globe) of the Portuguese navigator Ferdinand of Magellan (1480–1521), serving the Spanish crown, is very rarely mentioned in contemporary Portuguese literature, possibly due to the anti-Magellan feeling across the kingdom. This is a world in which the awe triggered by the nautical chart produced in the wake of Pedro Álvares Cabral's voyage to Brazil no longer exists. This is a planet

19 Original text: "Andrade—[...] Ver os pensamentos de meu amo: que o mundo é pouco par' ele." See Vasconcelos, *Comédia Eufrosina*, 57.

where it is not merely the known world—Europe, Africa, Asia—that seems to have been rounded twice, like in 1500. It is one where a brand New World has been fully circled, inspiring the famous verse (capturing this new sense of distances) from *Os Lusíadas* (“The Lusiads”) (1572), the epic poem by Luís Vaz de Camões (ca. 1524–ca. 1580): “Was there to be more world, and they (the Portuguese) would get there.”²⁰

While these two sentences seem to be the zenith of a new feeling about long-distance travel and control over the globe, in order to fully appreciate the profound existential transformation Europeans underwent in less than a century, one must read the celebrated allegorical episode of the *Máquina do Mundo* (“Machine of the World”) (*Os Lusíadas*, Chant X), where navigator Vasco da Gama (1469–1524), whom Camões turned into the collective heroic symbol of the Portuguese people, is crowned in glory by Tethys, the most important maritime nymph, for his nautical achievement of finding and establishing a maritime route from Portugal to India:

Uniform, perfect, and self-poised it be,
like the Archetype who designed it.
Astonished with desire as he was
when he saw this globe, Gama stood there.
Thus, the Goddess told him: “Here is the Epitome
of the World, reduced, that here I give
to those eyes of yours, so shall you see
where will you go and shall go, and what you desire.

Here you see the grand machine of the World,
ethereal and elemental, which was made
by the high and profound Intelligence
that has no beginning and no end.
He who surrounding holds this shapely sphere,
this globe and its smooth surface
is God: but what is God no one understands,
as the human genius does not reach that faraway.²¹

20 Original text: “E, se mais mundo houvera, lá chegara.” See Luís Vaz de Camões, *Os Lusíadas* (Porto: Figueirinhas, 1999), 297.

21 Original text: “Uniforme, perfeito, em si sustido, / Qual, enfim, o Arquetipo que o criou. / Vendo o Gama este globo, comovido / De espanto e de desejo ali ficou. / Diz-lhe a Deusa: – “O transunto, reduzido / Em pequeno volume, aqui te dou / Do Mundo aos olhos teus, pera que vejas / Por onde vás e irás e o que desejas. // Vês aqui a grande máquina do Mundo, / Etérea e elemental, que fabricada / Assi foi do Saber, alto e profundo, / Que é sem princípio e meta

Da Gama's crown of glory is to be given the opportunity to observe from Tethys's palace the machine of the world, a replica of the universe, a sphere designed by God containing the Aristotelian cosmological model, with the heavenly spheres, zones, and elemental Earth. The crown of glory is not only to observe God's creation, as only the deities do, which elevates this ship's captain to a divine realm, but also to provide Vasco da Gama with the possibility of being a master of his decisions concerning where he wants to travel on Earth, using the precious geographical information he is being given.

Conclusion

From looking at the heavenly bodies above, to setting one's eyes on the liquid horizon that maps out the entire globe, to beholding the entire universe from above with a bird's eye view (as in cartography made after the first voyages of circumnavigation, like the *Atlas* [1542] of Battista Agnese [ca. 1500–1564]), Camões's Da Gama is a literary character quite different from those of Duarte de Brito's poem, Jorge Ferreira de Vasconcelos's and Gil Vicente's plays, and João de Barros's chronicles. Almost a century after from the medieval ground zero chosen here to represent feelings and views about space, distance, and the globe, Da Gama represents a new way of looking at the world and long-distance: from above, equipped with the technical, technological, and scientific control over nature that long-distance oceanic voyages brought. A new world, one that humankind could hold in its hand. And a new blue poetics of distance, where the most remote place is also the most desired.

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limitada. / Quem cerca em derredor este rotundo / Globo e sua superfície tão limada, / É Deus: mas o que é Deus, ninguém o entende, / Que a tanto o engenho humano não se estende." See Camões, *Os Lusíadas*, 421.

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