

Introduction

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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.

About the Authors

Henrique Leitão is a Senior Researcher at the Department for the History and Philosophy of Science at the Faculty of Science, University of Lisbon, Portugal. He is presently Provost (*Pro-reitor*) of the University of Lisbon and

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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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