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Edward Collins*

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Abstract
In this article, I examine the presence and influence of the Faleiro brothers, Rui and Francisco, who accompanied Magellan to Spain in 1518. This article examines the respective contributions of each brother to the expedition itself, as well as their subsequent contributions to the development of nautical science and navigation in sixteenth-century Spain. It examines their recruitment and presence in the context of political division surrounding the recruitment of large numbers of foreigners for Spanish fleets and assesses whether there was a different approach or attitude toward individuals such as the Faleiros who had discernible skills.

Keywords: Magellan, cosmography in Portugal, navigation, nautical regiments, Spanish empire, Rui & Francisco Faleiro, longitude, magnetic variation, educating pilots, Imperial competition, nautical science.

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Resumo
Neste artigo, examino a presença e influência dos irmãos Faleiro, Rui e Francisco, que acompanharam Magalhães para Espanha em 1518. Analiso as contribuições de cada irmão para a própria expedição, bem como as contribuições subsequentes para o desenvolvimento da ciência náutica e da navegação na Espanha do século XVI. O artigo foca o recrutamento e a presença dos dois irmãos no contexto da divisão política em torno da incorporação de um grande número de estrangeiros nas frotas espanholas e avalia se houve uma abordagem ou atitude diferente em relação a indivíduos como os Faleiro, que tinham aptidões identificáveis.

Palavras-chave: Magalhães, cosmografia em Portugal, navegação, regimentos náuticos, império espanhol, Rui e Francisco Faleiro, longitude, variação magnética, ensino de pilotos, competição imperial, ciência náutica.

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* University College Dublin, Ireland.
ORCID: https://orcid.org/0000-0002-0680-227X. *E-mail*: edward.collins@ucd.ie.

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Introduction

In July 1519, Sebastião Alvares, Factor of the Portuguese court in Seville, wrote to King Manoel informing him of the preparations for Magellan's fleet, and of the Portuguese who were to accompany Magellan on his planned expedition. Among the numerous pilots, sailors, apprentices, and cabin boys, Alvares noted that Portuguese cosmographer Rui Faleiro was to captain one of the ships. Indeed, Alvares added that Faleiro had apparently included his entire family in his plans to serve the Spanish king: "Faleiro has his father and mother here, and brothers, one of whom he is bringing with him" (Coelho 1892, 434)[1]. The sibling who was to accompany Rui was presumably his younger brother Francisco, also a cosmographer. In the event, neither of the Faleiro brothers embarked on the expedition, and Rui's influence on navigational and nautical matters in Spain seems to have diminished considerably thereafter, though Francisco would have a lengthy career as a cosmographer for the Spanish crown. In spite of the importance of their contributions to the Magellan expedition of 1519 and subsequent development of nautical science in Spain, their legacies have been uncertain. This article examines the respective careers and influence of the Faleiro brothers in Seville from the inception of Magellan's proposal to the Spanish crown to Francisco's final contributions to Spanish nautical science in the 1560s. It assesses their impact in the broader context of Portuguese influence on Spanish navigation and nautical science in the sixteenth century and examines whether Spanish policy toward foreigners in Seville was consistent, or changeable depending on the circumstances. It asks what the experiences of the Faleiros can tell us about the greater Portuguese experience in Spanish navigation of the sixteenth century.

The Spanish transatlantic maritime enterprise of the 1500s required substantial numbers of individuals who were responsible for the safeguarding of an enormously complex network of transport that saw the move-

[1] "O Faleyro tem caa seu pay e may e irmaãos; hum deles leva consigo". The original document is at Arquivo Nacional da Torre do Tombo (hereafter ANTT), Corpo Cronológico, Parte I, Mç. 13, n. 20, 18 July 1519.

ment of humans, animals, and goods between Europe and America. By the final years of the sixteenth century, it has been estimated that between 7,000 and 9,000 men may have been required every year to crew the ships that linked Spain with its possessions in the New World (Pérez-Mallaína Bueno 1998, 52). The requirement for such a large body of men meant that a notable proportion of almost every ship must have been populated by non-Spanish in a variety of roles. Indeed, research has shown that this holds true for most of the sixteenth century[2]. With limited data available, it is difficult to determine exact numbers of foreign crewmembers on Spanish ships in the earliest years of the sixteenth century, but while it is evident that these were nowhere near the numbers required by the end of the century, there is still evidence to suggest that foreigners played a role in the Spanish transatlantic system from its earliest years. What is clear is that a turning point in recruitment of foreigners was reached with the expedition of Ferdinand Magellan in 1519. It is on Magellan's fleet that we see large numbers of foreigners on Spanish ships for the first time, but this is also significant for the fact that major Spanish resistance to foreigners is first seen, not just locally, but also through official channels and in the drafting of official policy surrounding recruitment of foreigners.

It should come as no surprise that, of all the foreigners recruited for Magellan's expedition, most originated in Portugal. This is due in part to the fact that it was an expedition that required individuals who may have had previous experience on Portuguese fleets to South East Asia, as well as the fact that Portugal's geographical proximity to Spain made human exchange between the kingdoms a relatively less-complicated affair than from anywhere else. Indeed, Magellan's decision to present his plan to the Spanish after falling out of favour in Portugal seems to have been an inevitable one. The Spanish discovery of the New World in 1492 set in motion a period of competition between the Iberian kingdoms over their respective claims and ambitions in the Atlantic and in Asia. While Magellan was not the first Portuguese to offer knowledge of navigation in South East Asia, his plan, as well as the subsequent migration of large numbers of Portuguese sailors to Seville, presented a new, unique problem for both

[2] A comparative study of the years 1518 to 1582, collating information from a variety of sources, and which tallies a total of 3,713 individuals, shows significant numbers of Portuguese, Italian, Flemish, German, Irish, and other Europeans in various roles on Spanish fleets. These numbers have been compiled from documentation at Archivo General de Indias (hereafter AGI): Contaduría 276, N.1; Contaduría 431, N.1; Contratación 1079, N.1-8; Contratación 1451; Contratación 3901, 3904, 3905, 3906, 3907, 3908, 3909; Contratación 4792; Justicia 1183, N.3, R.1; Indiferente 1562.

Spanish and Portuguese authorities. Also notable was the fact that Magellan did not present his plan alone. His partner in his proposed venture was Rui Faleiro, a cosmographer from Covilhã, who had prepared a detailed regiment for calculating longitude, which Magellan intended to use on his proposed expedition (Laguarda Trías 1975, 154). The plan presented by Magellan, as well as Faleiro's method for longitude calculation, appear to have impressed the Spanish officials enough to invite them to present their proposal to Charles V in February and March of 1518.

Part of Magellan's success in convincing the Spanish court of the feasibility of the project was due to the perceived scientific dependability upon which the proposal was based. In addition to the regiment on longitude prepared by Rui Faleiro, Magellan also presented a number of charts, one of which purportedly showed the Moluccas as lying within the Spanish demarcation. Bartolomé Leonardo de Argensola suggested that when Magellan attempted to secure Spanish support for his voyage, he used a planisphere made by the Portuguese cartographer, Pedro Reinel:

> [Magellan] returning to Portugal, found no favour, but thought himself wrong'd, and resenting it, went away into Castile, carrying with him a planisphere, drawn by Peter Reynel; by which, and the correspondence he had held with Serrano, he perswaded the Emperor, Charles V, that the Molucco Islands belong'd to him. (Argensola 1708, 11)

Magellan was certainly drawing on Portuguese sources to aid his petition to the Spanish crown, and while Pedro Reinel was unlikely to have been involved in his efforts, his son Jorge Reinel may have provided the necessary information. It is known that Jorge Reinel lived in Seville from at least 1519, perhaps earlier, and while his involvement with Magellan is speculative, it may at least serve to explain why Argensola made this claim. Jorge Reinel supposedly fled from Portugal to Seville in 1518 or 1519 after getting into trouble and may have offered his services to the Spanish authorities, who may have been eager to employ his talents, though it seems that his father was sent to fetch him in accordance with the wishes of the Portuguese crown (Cortesão et al. 1960, I: 20)[3]. Nonetheless, the Spanish were fortunate enough to have made use of their knowledge for a period, which, although brief, was significant. Though there is little left

[3] According to available information, Jorge Reinel received a royal pardon in 1532 for an incident some years earlier, when he cut the face of a cleric with a knife. Armando Cortesão and Avelino Teixeira da Mota have presumed this to be the same incident that caused him to flee to Seville. See ANTT, Chancelaria de D. João III, Doações, L. 18, fl. 48v.

of Jorge Reinel's work, there exists evidence of a planisphere, now unfortunately lost, which was most likely made by him there. Whether this is the planisphere described by Argensola as having been used by Magellan is uncertain, but it is the most likely candidate. That it showed the Moluccas as lying east of the demarcation line in the Pacific is significant, since this would have greatly increased the prospect of securing royal support for finding a western route to Asia. Sebastião Álvares, aware of the fact that the Reinels were in Spain, wrote to King Manuel in 1519, informing him of Jorge Reinel's knowledge of the Portuguese discoveries in the Moluccas. "I saw the lands of the Moluccas put on the globe and chart that was made here by the son of Reinel", he claimed, "which was not finished when his father came here for him, and his father finished it all and put on it those lands of the Moluccas" (Coelho 1892, 434)[4].

A Spanish or Portuguese Expedition?

While the Reinels may have departed Seville for Portugal thereafter, there is evidence that the expedition agreed between Magellan, Faleiro and the Spanish crown attracted other interested parties from Portugal. Considering the numbers required for such an expedition, this was not unusual. On 22 March 1518, upon agreement of the capitulation between the Portuguese aspirants and the Spanish, Charles V agreed that he would order

> [...] the equipping of five ships, two of one hundred and thirty tons each, and another two of ninety, and another of sixty tons, supplied with men, provisions, and artillery, which is to say that the said five ships will be supplied for two years, and in them will go two hundred and thirty-four persons for their management, to include masters, sailors, and ship-boys, and all of the other required people, in agreement with the memorial which has been made for this. (Fernández de Navarrete 1825-1837, IV: 119)[5]

In spite of the fact that Charles had ordered Magellan and Faleiro not to "discover nor do anything in the demarcation and limits of the most serene

[4] "Terra de Maluco eu vy asentada na poma e carta que ca fez o filho de Reynell, a qual nom era acabada quando caa seu pay veo por ele; e seu pay acabou tudo; e pos estas terras de Maluco".

[5] "Yo vos mandaré armar cinco navios, los dos de ciento y treinta toneladas cada uno, y otros dos de noventa, y otro de sesenta toneles, bastecidos de gente é mantenimientos é artillería, conviene á saber, que vayan los dichos navios bastecidos por dos años, é que vayan en ellos doscientas treinta y cuatro personas para el gobierno de ellos entre maestres é marineros é grumetes, é toda la otra gente necesaria, conforme al memorial que está fecho para ello". Original document is at AGI, Indiferente 415, Leg. 1, fl. 20r.

King of Portugal, my very dear and most beloved uncle and brother", the expedition would in fact compel the Spanish to impinge on the claims of Portugal in south east Asia and the explorations they had undertaken there (Fernández de Navarrete 1825-1837, IV: 117)[6]. Little wonder then that Portuguese seamen, who might claim some experience of the region, could pursue opportunities on an expedition requiring such manpower. This was in fact a major concern for Sebastião Alvares in his 1519 letter to Manoel, when he noted that there were so many Portuguese that the Spanish authorities had protested at their numbers. In addition to Magellan, Faleiro, and his brother, Alvares informed the king of several others who were to depart on the fleet:

> The Portuguese that are to go: [João Lopes] Carvalho, pilot. Estevam Gomez, pilot. Sserraão, pilot. Vasco Galego, pilot, who has lived here for some time. Alvaro da Mizquita of Estremoz. Martim da Mizquita of Estremoz. Francisco da Fonseca, son of the bailiff of Rosmaninhal. Christovam Ferreira, son of the bailiff of Castelejo. Martim Gill […] Pero d Abreu, servant of the Bishop of Safi. Duarte Barbosa, nephew of Diogo Barbosa, servant of the Bishop of Sigüenza. Antonio Fernandez, from Mouraria in Lisbon. Luis Affonso de Beja, who was the servant of the lady *Infanta*. João da Silva, son of Nuno da Silva, of the island of Madeira. (Coelho 1892, 433-434)[7]

Alvares's allusion to Magellan's conflict with Spanish authorities over the Portuguese crewmembers revealed a major point of contention – one that had been developing for some time, and which would ultimately follow Magellan to the open seas after the fleet's departure from Seville. Alvares and the Portuguese ambassador, Alvaro de Costa, had worked in concert with officials in Seville to complicate matters for Magellan. According to the Portuguese factor, the officials of the *Casa de la Contratación* produced orders that would contradict those previously given to him by the Spanish court. These included the refusal to pay the Portuguese members of Magellan's crew, and which specified a definite limit on the number of

[6] "No descubrais ni hagais cosa en la demarcacion é límites del serenísimo Rey de Portugal, mi muy caro y muy amado tio é hermano".

[7] "Os portugeses que ca vejo pera hirem: Item. O Carvalho, piloto. Item. Estevam Gomez, piloto. Item. O Sserraão, piloto. Item. Vasco Galego, piloto; ha dias que caa vive. Item. Alvaro da Mizquita, d Estremoz. Item. Martim da Mizquita, d Estremoz. Item. Francisco da Fonseca, filho do corregedor do Rosmanjnhall. Item Christovam Ferreira, filho do corregedor do Castelejo. Item. Martim Gill, filho do juiz dos orfaãos de Lixboa. Item. Pero d Abreu, criado do bispo de Çafy. Item. Duarte Barbosa, sobrinho de Diogo Barbosa, criado do bispo de Çiguença. Item. Antonio Fernandez, que vevja na Mouraria de Lixboa. Item. Luis Affonso de Beja, que foy criado da senhora Ifante que Deus tem. Item. João da Silva, filho de Nuno da Silva, da ilha da Madeira".

Portuguese who could serve on his fleet. Magellan countered that this limit was impractical, because there were not sufficient numbers of experienced men from the Spanish kingdoms who could take their places:

> His Majesty commands that no Portuguese seamen go on the Armada, whom the shipmasters have already taken on board and presented as suitable for the job, and [Magellan] has received them, as he has done with many other foreigners of these kingdoms, which is to say: Venetians and Greeks, Bretons, French, Germans and Genovese, because at the time they were received, there were none to be found who were natives of these kingdoms, despite having announced the salary the king would pay in Malaga, Cádiz and in all the county, and also in this city.[8]

In addition to presenting a major difficulty for Magellan, the resistance by *Casa* agents represents the first coordinated effort by Spanish officials to control numbers of foreign navigators on the *Carrera de Indias*. Indeed, in a pattern that would be repeated numerous times throughout the sixteenth century, the Portuguese were to bear the brunt of this effort, which would become official in 1527 as part of a wider programme of reform of pilot training at the *Casa de la Contratación*. This is explained by the Portuguese greatly outnumbering other nationalities on Spanish fleets, as well as the danger of their returning to Portugal with knowledge of the Spanish discoveries in America and the Pacific. While *Casa* officials may have had ulterior motives for restricting Magellan's crew in 1519, there is no doubt that his compatriots far surpassed other nationalities on ship manifests. After the restrictions were enforced (and it is clear that Magellan ignored them in large part), the Portuguese remained the largest non-Castilian group on the fleet with thirty-four known individuals[9].

[8] "Y quanto a lo su alteza manda q enla dha armada no vayan ningºs hombres de mar portogueses q los maestres dlas dhas naos los tomaron e se los presentaron por ser sufiçientes cada uno en su cargo y el los reçibio como hizo a otros muchos estrangeros destos reinos conviene a saber beneçianos y griegos e bretones e françeses a alemanes e ginoveses porq al tpo q los tomo no se fallava gente pala dha armada naturales destos rreynos aviendo fecho pregonar en malaga y en cadiz y en todo el condado y en esta çibdad el sueldo q su alteza les manda dar", AGI, Patronato 34, R.8, fl. 1r-1v, 26 July 1519.

[9] This number should be treated with caution. Some of these were Portuguese who had attempted to pass as Galician or Castilian. Additionally, there were at least fifteen crew-members whose nationalities were not recorded. It is also conceivable that some managed to pass successfully as Galicians or Castilians (Collins 2019, 205-206).

The Contributions of Rui Faleiro

What is notable about the restrictions placed on the Portuguese is that they did not seem to apply to those with theoretical knowledge or cosmographical training. There is no evidence that the Spanish wished to prevent the Faleiro brothers from departing with the fleet due to their nationality. Moreover, it seems that the *Casa de la Contratación* was quite content to accept the work offered by foreign individuals who might offer something other than seafaring skills. Most notable in this case is cosmographer Diogo Ribeiro, who arrived in Seville in the aftermath of Magellan and Faleiro's proposal. Sebastião Alvares's letter to the Portuguese king noted that, from the *Padrón* chart produced by Jorge and Pedro Reinel, "all the charts are made by Diogo Ribeiro, as well as the quadrants and globes. He is not going with the Armada and wants nothing more than to make his living from his abilities" (Coelho 1892, 434)[10]. Ribeiro continued to work for the Spanish crown after Magellan's departure. He was appointed cosmographer of the Casa in 1523, working in Seville and La Coruña, later forming part of the commission to reform the training and examination of pilots. He also produced a number of important planispheres for the Spanish crown, as well as nautical instruments and more efficient water pumps. In 1525, Antonio Ribeiro da Cunha wrote from La Coruña to the Portuguese crown informing the king that "Diogo Ribeiro a Portuguese is here who makes nautical charts, spheres, planispheres, astrolabes and other things for India, who has made moulds to build two metal pumps for trial with which they will experiment, and he promises to pump a ton of water with ten strokes for each pump" (Cortesão et al. 1960, I: 87-88)[11].

That Ribeiro's work was valued by the Spanish crown is beyond doubt. Antonio Sánchez has outlined succinctly the fervent activity of the Portuguese cosmographer in his brief tenure in the service of Spain before his untimely death in 1531:

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[10] "Por este padram se fazem todallas cartas; as quaees faz Diogo Ribeiro; e faz as agulhas, quadrantes e esperas; porem nom vay n armada, nem quer mais que ganhar de comer per seu engenho". The *Padrón Real*, or Pattern Map, was a general map stored at the *Casa de la Contratación* from which partial copies would be made for those departing for the Indies.

[11] "Hũu Diogo Ribeiro portugues esta aqui que faz cartas de marear esferas papa (sic) mundos estrelabios e outras cousas pera a India o qual tem feito formas pera fazer duas bombas de metal pera esperiencia que ham d'esperimentar em que se obriga que de dez golpes lance huu tonel d'augoa cada huua bomba elle tem do emperador trinta miill reais e fazemdo ho das bombas certo lhe poem mais sesenta miill"; Rêgo 1960-1977, I: 919; ANTT, Gavetas, Gaveta II, Mç. 10, doc. 20. I have used Armando Cortesão's English translation.

> He participated as an expert consultant in the Badajoz-Elvas *junta*, he collaborated in the translation of the *Libro de Duarte Barbosa* undertaken by the Genoese ambassador Martin Centurion in 1524, he created great planispheres and made charts for the expeditions of Jofre García de Loaisa and Simón de Alcazaba in 1525, he was involved in the creation of a globe… he examined pilots of the *Casa* from 1527 during the absence of Cabot, he constructed astrolabes, quadrants, sea compasses, other nautical instruments, and above all, metallic pumps – invented by him – to drain water on board a ship and in the interior of a mine. (Sánchez 2013, 194-195)[12]

In spite of the fact that Ribeiro, as Royal Cosmographer, had regular contact with highly sensitive maps and information on Spanish navigation, there is nothing to suggest that it was cause for concern among *Casa* officials or the crown. It is far more likely that his skills as a cosmographer and instrument maker far outweighed any apprehension about non-Castilian personnel working for the crown, especially at a time when the Spanish were looking to develop navigation and nautical science as a means to compete effectively with Portuguese exploration and colonisation in America and Asia. In this sense, it is not surprising that he and other erudite scholars such as Rui and Francisco Faleiro were perhaps granted a measure of latitude compared with those Portuguese who served in more transient roles on whatever ship would hire them.

Rui Faleiro's worth was certainly made known to the crown through the production of nautical instruments. In 1518 and 1519 he received a number of payments for the production of charts and other devices. Although he ordered the charts to be drafted by chartmaker Nuño García de Toreño (six in total), the accounts for the expedition show expenses of "1,071 maravedís for six wooden quadrants, which Ruy Faleiro made' and '750 maravedís for an astrolabe also made by Rui Faleiro"[13]. In spite of this, it is clear

[12] "Ribeiro fue la referencia cartográfica de la Casa de la Contratación durante la segunda mitad de los años veinte… Participó como consultor experto en la Junta de Badajoz-Elvas, colaboró en la traducción del Libro de Duarte Barbosa realizada por el embajador genovés Martin Centurion en 1524, levantó grandes planisferios y confeccionó cartas para las expediciones de Jofre García de Loaysa y de Simón de Alcazaba de 1525, estuvo involucrado en la realización de un globo o *poma redonda pintada con las pinturas del mundo*, examinó a los pilotos de la Casa desde 1527 durante la ausencia de Caboto, construyó astrolabios, cuadrantes, agujas de marear, otros instrumentos náuticos y, sobre todo, bombas metálicas —inventadas por él— para achicar agua a bordo de una nave y en el interior de una mina".

[13] "jUlxxj por seys quadrantes de madera que hizo Ruy Faleiro; dccl de un estrolabio de palo que hizo el dicho Ruy Falero"; AGI, Patronato 34, R.10, fl. 9r. 'Astrolabio de palo' refers to a nautical astrolabe suspended from a wooden tripod on a ship. Faleiro also ordered the production of four compasses. For more information on Faleiro's payments, see (Gil 2009, 350-351).

that he was not part of Magellan's plans purely for his instrument-making prowess – these instruments could be constructed by a number of individuals in Seville. Faleiro's true value to Magellan and the proposed expedition was his regiment for calculating longitude through which he promised to provide three different methods for calculating a ship's east-west bearing, "two of which were by the conjunctions and oppositions of the Moon with the planets and stars… and [the third through] the variation of the magnetic needle" (Mota 1975, 320)[14].

As Avelino Teixeira da Mota has noted, the accurate position of a vessel at sea required the two coordinates of latitude and longitude (Mota 1986, 95). Until the fifteenth century, these were estimated approximately, and often erroneously, especially before the phenomenon of magnetic declination (and its effect on the sea compass) was recognised[15]. Portuguese navigators are thought to have initiated the method of astronomical navigation to determine latitude at some point in the mid-1400s (Randles 1998, 49). When the Portuguese passed the Equator and the North Star could no longer be relied upon, the meridian altitude of the sun was used for the first time in the early 1470s. Determining longitude, however, was an altogether more complicated affair. Unlike latitude, which used the naturally fixed points of the Pole Star and the Sun, longitude could only be measured from an arbitrary location, such as the Fortunate Islands (or Canaries) used by the Romans in late Antiquity (Diffie et al. 1977, 132-133). An exact timekeeping device was also required, which was not achieved until the invention of the chronometer by John Harrison in 1730. The method commonly used by Portuguese and Spanish transatlantic navigators in the early years of the sixteenth century was to rely on the estimation of distance covered, as outlined by Martín Fernández de Enciso in his 1519 *Suma de Geographia*:

> Sailors calculate distance in an East-West direction in nights and days and with an hourglass and the calculation is reasonably correct for those who know their ship well and how much it sails in an hour; [...] Because their estimation is approximate [...] they over-estimate rather than under-estimate

[14] "O Regimento de Rui Faleiro tinha trinta capítulos, nele se indicando três processos para determinar a longitude, dois dos quais eram por conjunções e oposições da Lua com os planetas e estrelas… e pela variação da agulha magnética".

[15] The problem of magnetic declination or magnetic variation results from accepting a compass reading without making allowance for the difference between magnetic north (to which the compass needle always points) and true (geographic) north.

> the number of leagues [of their voyage] so as to be warned of their approach to land, rather than running upon it suddenly. (Randles 1995, 402)[16]

Because this was prone to errors in calculation, a number of methods were proposed to establish east-west measurement, so Faleiro's regiment was in fact part of a broader dialogue on the problem of longitude in Portugal in the early part of the sixteenth century. Proposed solutions included use of the hourglass, eclipses, lunar distance, and magnetic declination (Randles 1995, 402). The use of magnetic declination had been proposed in 1514 by João de Lisboa, who claimed erroneously that it varied according to longitude, and could thus be used to establish one's east-west location with accuracy (Albuquerque 1981, 132). As E.G.R. Taylor has noted, the Treaty of Tordesillas "made longitude a live issue once the [Spanish and Portuguese] rivals had met and disputed the Spice Islands in the eastern hemisphere" (Taylor 1956, 152-153). Indeed, Spanish recruitment of Portuguese personnel based on their knowledge of longitude pre-dated Magellan and Faleiro. A royal order in 1511, for example, to the officials of the *Casa de la Contratación* informed them that a "Juan Enriques, Portuguese, wishes to offer his advice and industry relating to the measurements of longitude of the east and west, which he says have not been yet been discovered". This knowledge, Enriques promised, would help secure the safety of the fleets in routes already established as well as in unknown seas[17].

Because the live issue of longitude was paramount in establishing Spanish or Portuguese rights of possession in the Spice Islands, Magellan's inclusion of Faleiro's regiment, in combination with the Reinel chart and globe, would seem to have provided a concrete solution for the Spanish in their attempts to claim dominion[18]. Although the original text has

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16 "Los marineros cuentan lo que andan por esta línea del Este e Oeste por días e noches, e por las ampolletas […] Y es buena cuenta a los que tienen conoscimiento de la nao en que van lo que suele andar por hora […] pero, como es arbitraria, la cuenta es incierta […] echan antes más leguas que menos, porque se hagan con la tierra antes que lleguen a ella […] e assí van por esta cuenta ciertos de no estropeçar"; Fernández de Enciso 1519: XXIIr. I have used W. G. L Randles's English translation.

17 "Yo soy ynformado q Juan Enriqs portugues… quiere dar avisso e yndustria pa las alturas de longitud q es dl este e hueste la ql dize q nunca se hallo hasta agora"; AGI, Indiferente 418, L.3, fl. 100r (1), 21 June 1511. This petition by Enriques seems to have been successful, although his planned expedition in 1513 with fellow Portuguese Juan Díaz de Solís did not take place (Coelho 1892, 262).

18 Magellan estimated that the Spice Islands were clustered in two groups. He believed that one group was located at 2.5 degrees from the line of demarcation and the other at 4 degrees from the line. Given the short distance, Magellan believed it was imperative to establish an accurate calculation to settle the matter of ownership (Mota 1986, 85). For Magellan's letter to Charles V outlining his estimations, see (Fernández de Navarrete 1825-1837, IV: 188-189).

been lost, there is compelling evidence to suggest that there are a number of extant copies that reproduce the essence of its instructions. Foremost among these is the 'Regole sull'Arte di Navigare', the final section of the journal of Antonio Pigafetta, who participated in Magellan's expedition as a supernumerary. This treatise on navigation includes the standard Ptolemaic model of the universe, which was very similar to Martín Fernández de Enciso's *Suma*. Additionally, Pigafetta's rules for determining latitude were transcribed from the 1509 *Regiment of Munich* (Mota 1986, 90). The final section of the 'Regole', however, is most notable for its outline of methods for calculating longitude. Titled 'Capitulo primo che parla de l'altura de levante a ponente', or 'First chapter that discusses the east-west measurement', it promised to provide three methods of calculation:

> Longitude indicates the degrees from east to west, for which I have considered many methods to find it, and among many I have found three by which longitude may be ascertained, and the last of these I will describe is the most palpable for those who do not know astrology or understand it. (Pigafetta 1894, 118)[19]

The three methods for calculation described by Pigafetta were obtained by: 1) measuring the latitude of the moon, 2) the conjunction of the moon with the stars or opposition of the moon with the sun, and 3) the variation of the compass needle. As Avelino Teixeira has noted, the authorship of this text was attributed to Pigafetta himself until Joaquim Bensaúde speculated that Pigafetta was in fact drawing upon the work of Rui Faleiro. Bensaúde (and later Luciano Pereira da Silva) attributed the work to Faleiro based on information from contemporaneous sources such as Fernão Lopes de Castanheda, João de Barros and Antonio de Herrera y Tordesillas (Mota 1975, 318). Both Castanheda and Barros describe Faleiro's work as containing thirty chapters (or sections), describing the same methods outlined by Pigafetta for obtaining latitude.

Pigafetta's access to Faleiro's regiment resulted from a number of factors. The most important of these was that Faleiro himself was prevented from taking part in the expedition in 1519. Faleiro's exclusion has long been attributed to his supposed mental instability. Sebastião de Alvares's letter to the Portuguese king noted in 1518 that "it seems to me that he is like a man disturbed in his senses, and that this familiar [spirit] of his has

[19] "La longitudine se chiama li gradi que hai de oriente in occidente, per il che ho considerato molti termini per trovarla, et fra molti trovay tre, per li quali la longitudine se poterà trovare, et l'ultimo, que dirò, è il più palpabile per quelli non sanno astrologia o per intenderla".

deprived him of whatever knowledge there may have been in him" (Coelho 1892, 433)[20]. Castanheda was similarly dismissive, describing a "Rui Faleiro who also went with [Magellan] to betray the king of Portugal, more than anything else, and claimed to be a great astrologer, but he knew nothing, and everything he pretended to know was because of a familiar spirit that he had, according to what was known later" (Castanheda 1979: II, 161 [bk. VI, ch. VI])[21]. Herrera later attributed Faleiro's madness to a "familiar demon" (Herrera y Tordesillas 1601: I, II, 66 [dec. II, bk II]). Whatever the reason cited by contemporaneous accounts, Faleiro was excluded from participating in the expedition by 1519, though he was still compelled to provide the regiment to Magellan under threat:

> Rui Faleiro [will] give and submit to the said Lord Judge Officials and to [Magellan] the measurement of east-west longitude, with all of the regiments that comply with it, according to what has been offered, so that it remains at the *Casa*, and may be brought on the said Armada, and that if the said measurement is not given… [Magellan] protests that nothing be given to Rui Faleiro of what they both have agreed with His Majesty… and if the said measurement is given, and is found not to be truthful or useful for the said navigation of east-west, he likewise protests that [Faleiro] should not benefit from the said agreement and rewards.[22]

Faleiro submitted the regiment to Magellan before the departure of the fleet, and its efficacy was examined by the pilots and pilot/cosmographer Andres de San Martín of the *San Antonio*. According to Fernão Lopes de Castanheda, the pilots were unimpressed with the methods outlined, responding to Magellan's queries in writing by noting that "the regiment could not be used, or approved for use in navigation" (Castanheda 1979, II: 163 [bk. VI, ch. VII]). Andres de San Martín agreed with the opinion of the pilots, noting however that the fourth chapter of the regiment was

[20] "Pareçeme que esta como homem torvado do juizo; e que este seu famjliar lhe despontou alguum saber, se o nele avia".

[21] "Ruy faleyro que também hia coele mais por fazer treyção a el rey de Portugal que por outra causa & faziasse grande astrólogo, mas não sabia nada: & tudo o que fingia que sabia era por hũ spirito familiar que tinha segundo se despois soube".

[22] "Quel dicho Ruy Falero dé y entregue á los dichos señores oficiales é á él el altura de la longitud de este hueste, con todos los regimientos que cumplen a ella, segund que se ha ofrecido, para que quede en la dicha casa, é se lleve en la dicha armada, é que no dando la dicha altura… él protesta quel dicho Ruy Falero no dé ninguna cosa de lo que tienen capitulado ambos á dos con su Alteza en razón de la dicha armada; é dando la dicha altura, y ella no siendo verdadera ni provechosa para la dicha navegación de leste hueste, asimismo protesto que no goce de la dicha capitulación é mercedes"; AGI, Patronato 34, R.8, 'Instrucción a Fernando de Magallanes', 8 May 1519.

useful, since it showed that "through the conjunction of the moon with the fixed stars and with the sun, one could deduce the distance of one land from another in their east-west measurement..." (Silva 1921, 87)[23]. The third method for calculating longitude through magnetic variation of the compass needle was found to be quite useless, calculating the value of the variation as equal to the longitude of a place relative to the island of Tenerife, which the regiment considered to be the 'true meridian' (*o meridiano vero*), i.e., where magnetic north and geographic north coincided (Mota 1975, 321).

This seems to have been the final contribution of note by Rui Faleiro to the Spanish nautical enterprise and was itself of little consequence beyond Faleiro's recognition of the issue of magnetic variation. His reappearance in Portugal in 1520 led to a period in prison for treason (Gil 2009, 354). Faleiro returned to Seville thereafter and remained in the care of his brother Francisco for the remainder of his days, his illness preventing any attempts to participate in Spanish initiatives in the Moluccas beyond a series of letters written in vain to Charles V, where he requested a licence "that I may prepare a ship or two at my cost" to lead to South East Asia.[24] "I believe that I will do [the expedition] much more justice", he continued, "in going with my charts, my instruments and my knowledge, rather than sending it with someone who cannot understand it"[25]. Otherwise, there seems to be little subsequent trace of Faleiro's imprint on maritime affairs in Seville, whether at sea or in the *Casa de la Contratación*.

Avelino Teixeira da Mota has suggested that Faleiro's regiment was lacking in practical usefulness because Faleiro possessed a considerable amount of astronomical knowledge, but very little knowledge of nautical problems. For all of that, he accepts the significance of Faleiro's regiment, which constituted part of a body of investigation centred on the identification of magnetic variation of the compass needle, which had begun in Por-

[23] "Concertando-se as naus, Fernão de Magalhães mostrou aos pilotos e ao astrólogo Andres de Sam Martim o regimento que levava de Rui Faleiro acêrca de se poder saber a altura de leste a oeste... E visto o regimento por todos, mandou-lhes Fernão de Magalhães que dissesse cada um o que alcançava a saber, e se se podiam aproveitar dêle em sua navegaçao. E os pilotos responderam por escrito que não se podia usar daquele regimento, nem aproveitava para se navegar por êle. E assim o assinaram: e o astrólogo respondeu o mesmo a todos os capítulos do regimento que eram trinta, salvo ao quarto que dizia que pola conjunção que a lua tem com as estrêlas fixas, e com o sol se pode saber o que uma terra dista da outra na altura de leste a oeste...".

[24] "Suplico a v. magestad me faga merçed q de liçençia q yo pueda armar vna nao o dos a mi costa"; AGI, Patronato 34, R. *22*, *22* March 1523.

[25] AGI, Patronato 34, R. *22*.

tugal in the late-fifteenth century (Mota 1975, 321-322). Although attempts to associate magnetic variation with measurement of longitude were ultimately fruitless, acknowledgement of its existence appears to have been more widely accepted at an earlier stage among Portuguese scholars than their counterparts in Spain – a notable contrast is Spanish cosmographer Pedro de Medina's failure to recognise magnetic variation as a real phenomenon as late as 1545 in his *Arte de Navegar*. Rui Faleiro's brother, Francisco, had attempted to mitigate its effects on navigation in his 1535 *Tratado del Esphera y del Arte del Marear* (Collins 2013, 27). It is very likely that Francisco Faleiro's treatise is informed to some extent by the work undertaken by his brother, and, aside from the validation that Rui Faleiro's scientific credentials may have provided for Magellan's proposal in 1517, it is in this subtle influence where the Portuguese cosmographer's lasting impact may be found.

Francisco Faleiro and the Reform of Navigation in Spain

While Rui Faleiro's younger brother may have had a lengthier career in Spanish service, it began inauspiciously. After his arrival to Seville with his brother and Magellan in 1518, Francisco Faleiro did not participate in the resulting expedition, in spite of Magellan's plans to have him replace his infirm brother. Much of Faleiro's time thereafter was consumed with caring for Rui, as well as contesting the rights and claims of Rui's wife, Eva Alonso, to Rui's salary. Indeed, his relationship with Diogo Ribeiro was soured from 1526 due to Ribeiro's intercession on behalf of Eva Alonso (Vigneras 1962, 80-81). Otherwise, Faleiro's activities in Spain in the 1520s are not well recorded aside from his representations to the Spanish court on behalf of Francisco de Santa Cruz and Franco Leardo, business partners of Sebastian Cabot, who was at this time to be found in the Río de la Plata undertaking a vain search for gold. Santa Cruz and Leardo tasked Faleiro with reporting back on the position of the court on Cabot's claims, and ensuring that their rights would not be affected by any change in plans (Gil 2009, 390).

From the 1530s, the increasing visibility of Faleiro in matters relating to cosmography and navigation became more apparent. He wrote to the emperor in 1531 complaining that his talents had not been utilised sufficiently after the departure of Magellan's fleet. "Your Majesty sent a second armada without commanding me to serve on it", he wrote, "not sending anyone in that capacity who knows as much as I know, or who with greater

reason could serve Your Majesty more than I" (Serrão 1969)[26]. His penury, resulting from this, as well as the legal battles he fought to protect his brother's rights, meant that if he were not adequately compensated by the court, he "would be forced to go and serve another king so that I may survive"[27]. His pleas appear to have succeeded. His annual salary was rounded up to 35,000 *maravedís* in 1531 and was again increased to 50,000 *maravedís* in 1532 (Gil 2009, 391).

The Spanish crown's attitude toward Faleiro contrasts somewhat with its approach to other, less-erudite Portuguese servants. Though we have little evidence that Faleiro provided any kind of theoretical or practical knowledge to Spanish navigation in the late 1520s, his salary increase would at least suggest a recognition of the service he was capable of providing. By contrast, reforms at the *Casa de la Contratación* in the same period included, for the first time, regulations on the number of foreigners allowed to hold specific offices on the *Carrera de Indias*. One of the motives for wider reform, according to Luisa Martín-Merás, "was the poor scientific preparation of the pilots owing to the lack of knowledge of the Pilotos Mayores, who were charged with teaching, since the first three appointments were practicing seamen, unequipped to pass on to others a theoretical knowledge that they, in many cases, did not have" (Martín-Merás 2003, 669)[28]. Included in this reform was an explicit instruction relating to the origins of the *Carrera* pilots:

> Firstly, he who wishes to be a pilot must be a native of these our kingdoms of Castile, and you will not give the charge of pilot to any foreigner or allow him to possess a sea chart or any other image of the Indies, or will he be given or sold one without our special licence.[29]

These restrictions were prompted by high numbers of foreigners on Sebastian Cabot's 1526 expedition to the Río de la Plata, as well as the

[26] "V. Mag^{de} embio segunda armada syn que me mandase servir en ella no embiando en ella persona que en aquella facultad mas ni tanto que yo supiese ni de quien con mas razon S. Mag^{de} en ello se duviera servir como de mi". The original document is at the Archivo General de Simancas, Estado 369, 90.

[27] "Me seria forçado yr a servir a otro Rey para que me dé de comer".

[28] "Uno de los motivos era la poca preparación científica de los pilotos debida a la insuficiencia de conocimientos del piloto mayor, encargado a la enseñanza, ya que los tres primeros nombramientos recayeron en marinos prácticos que ellos, en muchos casos, no tenían".

[29] "Primeramente el que quisiere ser piloto a de ser natural destos nros rreynos de castilla y a nyngun estranxero dareys cargo de pilotaje my el consentireis tener carta de marear ny pintura ninguna de las yndias ni que por otro alguno le sea dada ny bendida sin nra hespeçial liçenzia"; AGI, Patronato 251, R.22, 2 August 1527.

across the wider fleets that departed for the New World, although the limitations seem to have applied mainly to those who were seeking the office of pilot. While these restrictions may have been at the behest of officials who worked at the *Casa* (and who may have had other, more personal motivations), it is clear that restricting the pool of pilots serving on Spanish fleets did have genuine security concerns, considering the sensitive knowledge one could accumulate through extensive travel on Spanish routes or through the possession of highly secretive maps. Why these restrictions, therefore, did not seem to apply to non-Spanish cosmographers (and Portuguese cosmographers in particular) is another question. Although Rui Faleiro did not participate in any Spanish expeditions after 1519, the presence of foreign cosmographers after the instigation of these reforms suggests that the laxer attitude that had been shown previously towards the Reinels, the Faleiros, and Diogo Ribeiro would continue to be guided by practical considerations. It might have been possible, for example, to argue that replacing foreign pilots with native ones could be done with relative ease, but the theoretical knowledge of cosmography – as well as confidential information on Portuguese navigation, nautical science, and instrument production – would be a much more valued (and uncommon) set of skills. Moreover, considering the fact that payment for piloting a ship was often meagre, seafarers of different ranks might be considered prone to seeking fortune in other kingdoms[30].

Francisco Faleiro's most important contribution to nautical science in Spain is undoubtedly his *Tratado del esphera y del arte del Marear*, published in Seville in 1535. The *Tratado* was comprised of two parts. The first, containing twenty-two chapters, was a standard treatment of the celestial sphere, was taken from Sacrobosco's thirteenth-century *De sphaera mundi*. The second, comprised of nine chapters, was a practical guide to the art of navigation. Faleiro's *Tratado* was one of the earliest publications on the art of navigation in sixteenth-century Spain, and notable for the fact that it was the first to recognise the problem of magnetic variation of the compass needle. Indeed, Faleiro postulated that, rather than being an impediment to navigation, the pilot could, with training, use this phenomenon to his advantage:

[30] In practice, it is clear that theoreticians were no less inclined toward seeking better opportunities, as evinced by Francisco Faleiro's plea to the Spanish crown in 1531. Sebastian Cabot is also known to have sought more lucrative opportunities elsewhere in spite of his role as Piloto Mayor of the *Casa de la Contratación*, and in fact left Spanish service in 1547 to work for the English crown. Dalton 2016, 179.

> The variation of the (compass) needle creates much doubt for navigators, which they may be able to dispel by knowing precisely how they (the needles) vary. And beyond what has just been stated, other uses may result, such as knowing precisely which route they are navigating, which, when known, will be followed precisely without error or detour. Moreover, it will shed much light on the longitude that they are navigating. (Falero 1535, 40r)[31]

This, of course, was derived from his brother's belief that longitude could be determined through magnetic variation, in spite of evidence to the contrary[32].

Faleiro also suggested that the problems presented by magnetic variation at sea could be mitigated with a degree of preparation. Accordingly, he suggested the construction of a circular plate, graduated on the circumference, with a hollow in the centre in which the compass could be placed. On top of the compass a semi-circular blade would be placed vertically and fixed to the plate. At midday, the plate was to be oriented until no shadow was cast by the blade – this position would be the meridian. The direction to which the compass needle was pointing would indicate the angle of variation, which could then be read from the graduations around the edge of the plate. Though the instrument was ideal for use at midday, Faleiro also noted that it could be used in the morning and the evening:

> Another good way to easily determine the meridian with the same instrument is by taking the shadow of the sun one, two, three etc. hours before midday and noting on which part of the instrument it falls; and at similar times after midday as was undertaken before, measuring the shadow again, ensure that the Sun is at the same altitude after noon as it was before when the first shadow was measured. And having determined both shadows, their mean will be the precise meridian. And this is a very good rule, as much for being true as it is for allowing more times per day than the others; and if its order is well observed, there can be no error in it. (Falero 1535, 42v)

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[31] "El nordestear de las agujas pone a los mareantes en muchas dudas, de las quales podrán salir con saber precisamente lo que ellas nordestean y noruestean. Y allende de lo dicho se seguirán otras utilidades, assí como saber precisamente por qué rumbo navegan, lo qual sabido seguirán precisamente sus derrotas sin yerro ni rodeo. E también les alumbrará mucho para saber lo que navegan por longitud". Faleiro referred to variation as the 'northeasting' and 'northwesting' of the needle.

[32] In fact, H. D. Harradon has noted that the theory espoused by the Faleiros was stubborn, based on "a belief which persisted throughout the seventeenth century and encouraged the making of many magnetic observations which, although useless as far as longitude-determinations were concerned, at least furnished data of great value in advancing knowledge of geomagnetism" (Harradon 1943, 79).

The chapter on magnetic variation as an obstacle which could be utilised mirrored Faleiro's belief that a navigator had to be much more than an artisan who based his skills on years of practical experience. For Faleiro, the art of navigation had to be, in its essence, derived from scientific principles, which were then applied to the ship. The pilot, therefore, must be a man of learning, with knowledge of the most fundamental tenets of navigation that were to be absorbed at the beginning of his career, because "the sciences or arts do not fit well on those who lack such principles" (Falero 1535, 29r)[33]. Outlining sixteen fundamentals of navigation, Faleiro provided a succinct explanation of terms including latitude, longitude, the sun's shadow, the difference between a route and a rhumb, and of course, the 'northeasting' and 'northwesting' of the compass needle (Falero 1535, 29r-v). A pilot who was well trained and well prepared, he noted, could minimise any danger that might present itself at sea, although he was always at the mercy of his apparatus. Therefore, he wrote, "one should strive to bring the most precise instruments, and the more the better" (Falero 1535, 30v)[34].

In spite of Spanish cosmographer Alonso de Santa Cruz's accusation in the 1540s that Faleiro "knew only a little about the *Sphere* and judicial astrology", and "presumed to give his opinion just like one who understood better", Faleiro's work displayed his considerable expertise in navigational matters (Sandman 2001, 143)[35]. This expertise was called upon in the 1530s during the proposed updating of the *Padrón Real* at the *Casa de la Contratación*. The updating of the *Padrón* exposed a number of conflicts and issues related to map and instrument production in Seville, revealed in testimony submitted by Faleiro. Faleiro, among others, protested an agreement between *Piloto Mayor* Sebastian Cabot and cosmographer Diego Gutiérrez, which had created a monopoly on the instrument and map business in Seville, locking out other cosmographers. Resulting from this was a major issue related to the accuracy of the *Padrón Real*, which, by law, had to be used by pilots as a navigational guide. Gutiérrez's charts, however, conformed to different parameters, providing pilots with two-scale charts

[33] "Las sciencias o artes no quadran bien en aquellos que de los principios carecen".

[34] "E deve procurar de llevar instrumentos muy precisos e quanto mayores mejores".

[35] "Estava Pero Mexia presente que en aquel tiempo en toda su vida avia visto carta de marear ni entendia aquellenguaje y un Francisco Falero que solo sabia un poco de la esfera y de astrologia judiciaria y presumian de dar su parecer como el que mexor 10 entendia..."; AGI Justicia 945, fl. 168v, 6 September 1549. Santa Cruz was levelling a similar charge against cosmographer Pedro Mexía. I have used Alison Sandman's English translation of the text.

instead[36]. Abiding by the *Padrón Real* was a futile endeavour, according to Gutiérrez, because the pilots often threw their copies of it overboard and sailed with an older chart because it was rooted in baseless theory, which bore no relation to what they encountered on their expeditions (Lamb 1995, 45-46)[37].

Interestingly, Faleiro also agreed with Gutiérrez's assertion that the *Padrón Real* was unsuitable as a master chart, though he blamed the fact that there was no standardised system among the pilots for collating the necessary data to compile it. Because they each used their own methods, he argued, they often achieved different and contradictory results. Moreover, because many of them relied upon the accuracy of Diego Gutiérrez's two-scale charts[38], Faleiro accused them of pre-empting their own failure:

> Because the second graduation that Diego Gutiérrez puts on his charts goes against the art and creates many variations and disorders all of cosmography, being something so unacceptable… I will leave it, so as not to spend time on something so unwise, although to those who do not understand, it carries much weight with a great number of pilots who approve of it, which should only be used to show manifestly how little they understand the art from which they live, and it should be enough to condemn them, having rounded the world with the charts that my brother and Ferdinand Magellan and I created with just one graduation, with which the *Especiería* was discovered.[39]

Furthermore, Faleiro remarked that "Vespucci and Nuño García never put two graduations on the charts that they made, nor in Portugal do they

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[36] Gutiérrez created charts with different scales of latitude, which attempted to allow for the problem of magnetic variation. When combined with Gutiérrez's compasses (also adjusted for magnetic variation) however, the errors encountered and recorded by the pilots were often compounded (Lamb 1995, 45-46).

[37] The conflict has been oversimplified here for the sake of brevity. For a complete account of the conflict, see Lamb 1995 and Sandman 2001.

[38] Gutiérrez created charts with different scales of latitude, attempting to allow for the problem of magnetic variation. When combined with Gutiérrez's compasses (also adjusted for magnetic variation) however, the errors encountered and recorded by the pilots were often compounded (Lamb 1995, 45-46).

[39] "Porq la segunda graduacion q d° gutierrez pone en las cartas es cosa contra toda arte y q haze muchas variaciones y desordena a toda cosmografia como a cosa reprova y sin ningun descargo la dexo por gastar tpo. en cosa tan desatinada aunque a quien no lo entiende le haga fuerça contan gran numero de pilotos q lo aprueban lo ql debe solam^e aprovechar para q se vea manifiestam^e quan poco entienden del arte de que viven y debe bastar para condenallos averse rredondeado todo el universo por las cartas q mi hr° y hernando de magallanes y yo hezimos de una sola graduacion con que se descubrio el especeria"; AGI, Justicia 1146, N.3, R.2, Bloque 1, fl. 6v, 5 May 1544.

use them"[40]. The *Padrón*, by its very nature, could not be relied upon if it were founded upon information collected by pilots who were working with materials that were so poor, "because it is well known that everything founded upon two graduations is false"[41].

Faleiro's contributions to the debates surrounding the *Padrón Real* are notable for their impartiality in contrast to the submissions of the other cosmographers and Cabot, who at times allowed their broadsides to become personal. Although Faleiro accused the two-scale charts of Gutiérrez of being unfit for purpose, he also admitted that any resulting damage during a pilot's navigation could not be said to be the entire fault of the erroneous chart, because the incompetence of some pilots could at times also be to blame, reflecting his belief in the need for well-educated navigators. To his dismay, he noted that the fundamentals of sound navigation – that is, knowledgeable pilots and well-designed instruments – were not being adhered to at the *Casa de la Contratación*, resulting in the poor quality of the *Padrón Real*, and the pilots' unfortunate preference for using Diego Gutierrez's two-scale charts.

Unsurprisingly, he also blamed the pilots' lack of knowledge of magnetic variation, which led to the inaccurate representation of the routes they plotted. If they were aware of it, he declared, they ignored it, because they lacked the necessary instruments to account for it. Notwithstanding the fact that he had invented an instrument for this, he complained that, despite being in the possession of Diego Gutiérrez for six years, it had never been used by the pilots[42]. He concluded that the most convenient solution for the problems relating to the *Padrón Real* was to send a ship to sea with a cosmographer and the most experienced pilot and master to allow for the most accurate collation of data, combining the learning of the theoretician with the practical expertise of the mariner to produce a chart worthy of the *Carrera de Indias*, which would prevent the loss of ships and lives.

In spite of Faleiro's confidence in his solution, as well as his desire to educate pilots through the reading of his *Tratado*, it is not clear that his opinion carried much weight among navigators. High levels of illiteracy

[40] "Vespuche y nuño garçia q las dhas cartas fabricaron jamas pusieron en cartas dos graduaciones ni en Portugal tal usan"; AGI, Justicia 1146, N.3, R.2, Bloque 1, fls. 6v-7r. It is unclear to which Vespucci he was referring, though it may have been Juan, because he was placed in charge of the *Padrón* with Juan Díaz de Solís.

[41] "Pues es tan notorio ser tan falso toda cosa fundada sobre dos graduaçiones"; AGI, Justicia 1146, N.3, R.2, Bloque 1, fl. 6v.

[42] AGI, Justicia 1146, N.3, R.2, Bloque 1, fls. 8r-8v, 5 May 1544.

among Spain's seafarers would remain an issue in sixteenth-century navigation, preventing access to the work of Faleiro or other cosmographers. In any case, it is difficult to believe that many pilots would have been willing to concede that a theoretical approach to navigation was the basis for a safer and more efficient *Carrera de Indias*. While the art of navigation became increasingly technical and reliant on scientific input in the sixteenth century, this was the result of land-based theoreticians, most of whom had never been to sea, and who were not in a position to judge accurately the merits of a pilot's less quantifiable abilities, such as his recognition of landmarks, his knowledge of the nature of currents, winds and birds, his reliance on weather markers, and so on. In contrast to other works of cosmography, such as Pedro de Medina's 1545 *Arte de Navegar*, Faleiro's *Tratado* does not seem to have made an impact outside of Spain either (Navarro Brotóns 2000)[43]. It did influence Pedro de Medina's *Libro de Cosmographía* of 1538, however, which copied entire paragraphs from Faleiro's work (Medina 1972, 27). If Medina's *Arte de Navegar* became the standard that subsequent navigational manuals followed, David Waters has noted that "its pattern was set by Faleiro" (Waters 1970, 14).

Faleiro's only subsequent known contribution to navigational and scientific matters in Spain occurred in 1566 when he was called, with a number of other cosmographers, to offer his advice on Spanish rights in the East in the aftermath of attempts to settle the Philippines, though his testimony appears to have been lost (Collins 2013, 32). He was involved in other non-cosmographical ventures in Seville, which do not seem to have brought him much wealth. These endeavours involved publishing writing books and catechisms for children, as well as an ill-fated attempt to organize an expedition of the Amazon in 1558. There are no references to Faleiro in Seville after 1570, but it is probable that he was still alive by this point[44]. The most significant work undertaken by Faleiro, however, had occurred in the 1530s and 1540s at a time of significant reform and upheaval in navigation and nautical science at the *Casa de la Contratación* in Seville. Faleiro's contributions to this dramatic period are conspicuous in favour of modernisation through scientific theory and the education of seafarers – a familial coda, perhaps, to the comparable ambitions of his brother, as outlined in his ill-fated regiment.

[43] Medina's work was translated and re-edited fifteen times in French, Flemish and English. Martín Cortés's 1551 *Breve Compendio de la Sphera y de la Arte de Navegar*, was published six times in English as *The Arte of Nauigation* (Navarro Brotóns 2000, 352).

[44] Juan Gil has noted that his wife's will did not list her as a widow (Gil 2009, 389-409).

Conclusion

On the 500-year anniversary of Magellan's departure from Seville for south east Asia, it is worth reconsidering whether we should classify his expedition as a Spanish or Portuguese venture. This is hardly a novel proposal: the issue of the expedition's origins has in fact been subject to disagreement in the past, most recently on the pages of *ABC*, Spain's national newspaper. On 10 March 2019, the newspaper published a report, issued by the *Real Academia de la Historia* in Spain, which purported to outline the "objective historical facts that demonstrate the official Spanishness of the maritime feat, which culminated in the first circumnavigation of the Earth"[45]. Compounding the unusual nature of this declaration was the fact that the report by the *RAH* was issued at the request of ABC director, Bieito Rubido, in a declared effort to "prevent the commemoration… from becoming a source of dissent between the two neighbouring countries". Without wishing to become entangled in the nationalistic posturing propounded by ABC and the *RAH*, it is nonetheless important to challenge the ironic ahistoricism of the report by calling attention to the work of the Faleiro brothers in the Spanish maritime enterprise of the sixteenth century[46]. Indeed, for all of its bravado, the report inadvertently highlights the indifference in popular Spanish history toward the significance of Portuguese knowledge and skill in its imperial affairs during its so-called Golden Age.

Although the expedition of 1519 was funded by the Spanish crown and various private interests, there is no question that it was made possible through the initiative of Magellan and the equally important royal perception of Rui Faleiro as an authority on astronomical and nautical matters (as well as the maps provided by Pedro and Jorge Reinel). Without Faleiro's regiment, without the Reinel charts, without the substantial numbers of Portuguese seafarers, no expedition would have taken place in 1519. The

[45] "… los hechos históricos objetivos que demuestran la españolidad oficial de la gesta marítima que culminó con la Primera Circunnavegación a la tierra"; 'Informe de la Real Academia de la Historia sobre la Primera Circunnavegación a la tierra', http://www.rah.es/informe-de-la-real-academia-de-la-historia-sobre-la-primera-circunnavegacion-a-la-tierra/, accessed 14 August, 2019. Thanks must go to Iris Rodríguez Alcaide for drawing my attention to the report. See 'La 1.ª vuelta al mundo no fue 'plena y exclusivamente española' (artículo-respuesta a ABC y RAH)', in *El Coloquio de los Perros*, https://coloquiodelosperros.org/2019/03/18/la-primera-vuelta-al-mundo-no-fue-plena-y-exclusivamente-espanola-articulo-respuesta-a-abc-y-rah/, accessed 14 August 2019.

[46] It also behoves us to wonder why one should be keen to claim ownership of a venture predicated on the domination, suppression, and exploitation of indigenous peoples in the Philippines and the Moluccas.

repeated failures of the Spanish to locate a western sea route to the Moluccas before Magellan and Faleiro serve to highlight the importance of this fact. This points to a larger, ignored issue – that is, Spanish navigation and nautical science of the sixteenth century owes a major debt to the work of the Faleiros, the Reinels, Diogo Ribeiro and countless other named and unnamed Portuguese cosmographers, instrument-makers and seamen.

In spite of this detail, it is clear that the à la carte recognition of Portuguese influence in the *Carrera de Indias* has long been a feature of the Spanish imperial narrative. We see this in the inconsistent treatment of the varied Portuguese actors from the early 1500s. While the Spanish crown was embracing the expertise of individuals such as Rui and Francisco Faleiro, it was simultaneously attempting to restrict those who were perceived to offer less valuable service. Nevertheless, Rui and Francisco Faleiro represent the most important aspects of Portuguese contributions to Spanish nautical and navigational affairs in the early modern period, and in fact serve as a microcosm of this influence. Rui Faleiro's self-assured regiment, in ensuring the success of Magellan's proposal to the Spanish crown, allowed for the emergence of a significant Portuguese element to Spanish maritime affairs through the application of Portuguese theoretical principles, as well as the subsequent migration of significant numbers of pilots, masters, sailors and apprentices into Spanish service from the 1520s. The principles endorsed by Faleiro were continued and developed by his brother Francisco, who formed part of the effort in mid-sixteenth century Spain to modernise and regularise seafaring through theory, improved instrument design, and the education of pilots. While his efforts were apparently valued by the Spanish crown, his relative anonymity compared with his Spanish contemporaries serves as a useful symbol of Spanish disregard of the significance of Portuguese contributions to their maritime, and therefore imperial, power in the sixteenth century. Lachrymose nostalgia for a nebulous Golden Age will do little to change these matters.

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