FOREWORD

The series of Conferences "History of Mathematical Sciences: Portugal and East Asia" started in 1995, with a meeting held at the Convento da Arrábida, Portugal, and was continued in 1998 with a conference held at the University of Macao. The main aim of these meetings has been to analyze the interaction between Europe and China from the the sixteenth to the eighteenth century in the field of the mathematical sciences, bringing to the fore the role of Portugal as an agent of transmission in this process.

As soon as Portugal started to annex territories outside mainland Europe in the fifteenth century, there was a will on the part of Portuguese kings to exert influence on religious matters in their new possessions as well on their home territory. Already in 1436 King Duarte (1391–1438) tried to obtain from the Pope a say for the Portuguese Crown on the appointment of bishops in Portugal. Pope Nicholas V (1397–1455) wrote two Bulls in 1452, *Dum Diversas*, and in 1455, *Romanus Pontifex*, addressed to King Afonso V (1432–1481), by which he allowed the Portuguese to build churches in their new territories, as well as in those to be annexed in the future, and gave Portuguese kings permission to nominate missionaries for those territories. Pope Callistus III (1378–1458) confirmed these decisions in the 1456 Bull *Inter Coetera*, and accorded the spiritual jurisdiction of these territories to the Order of Christ, of which Henry the Navigator (1394–1460) was Grand Master. These Papal Bulls mark the beginnings of the Portuguese Padroado ("Patronage") of the Orient.[1]

Since its beginnings (1540), the Society of Jesus had set mission in pagan lands as one of its main targets. Working under the Padroado, it played a major role in the enterprise of evangelization of Asia.[2] Jesuits from various catholic countries were sent thus to the mission. They traveled to Asia aboard Portuguese ships, having received at least part of their training in philosophy and theology before

[1] The Padroado was a set of privileges granted by the Pope to the Portuguese crown. These included the administration of funds given by the crown for the management of all religious buildings in its territories and the right to propose to Rome lists of church officials for those territories. This guaranteed the Portuguese Crown a portion of ecclesiastical revenues of the kingdom. In exchange, the king was to send missionaries to his newly acquired territories, and endow the religious establishments founded for this purpose. An important work on this subject is António da Silva Rego's *O Padroado Português do Oriente*, *Esboço Histórico*, Lisbon: Agência Geral das Colónias, 1940. Rego, a University of Louvain graduate, was himself a missionary from the Padroado in Macao. The book was commissioned by the General Agency of Portuguese Colonies for the double 1940 celebration of the eighth centenary of the founding of Portugal (1140) and of the third centenary of the country's regained independence from Spain (1640).

[2] See Alden, Dauril, *The making of an enterprise: the Society of Jesus in Portugal, its empire, and beyond*, Stanford: Stanford University Press, 1996. On the Jesuit China mission in particular see Brockey, Liam, *Journey to the East: The Jesuit Mission to China, 1579–1724*, Cambridge, Mass.: Harvard University Press, 2007.

leaving Europe. From the late sixteenth century on, Jesuit education put great emphasis on the mathematical sciences. Thus evangelization by the Jesuits led to the transmission of some important elements of European mathematical sciences to East Asia. The essays in this volume discuss different case studies that reveal the various ways in which Jesuit scientific culture and Portuguese policies regarding education, trade and mission shaped the reception of "Western learning" in China, Japan, Korea and Vietnam in the early modern period. Although these essays mostly fit in the period between 1552, when the Ming emperor gave the Portuguese permission to establish a settlement in Macao, and 1773, when the Pope suppressed the Society of Jesus, some of them show that the knowledge brought by the Jesuits under the Padroado continued to shape East Asian science to the end of the nineteenth century.

The historiography of the circulation of the mathematical sciences imported from Europe to East Asia has long been shaped by preconceptions such as the superiority of European science over that produced in other parts of the world, and pro- or anti-Jesuit biases. An illustration of the latter is found in the historiography of Portuguese mathematics. Since the pioneering work of the Portuguese mathematician and historian of mathematics Francisco de Borja Garção Stockler (1759–1829) the control of the Society of Jesus over education has been pointed out as one of the two major factors of the so-called decline of the Portuguese mathematics. This "decline" period lasted about two hundred years, from Portugal's loss of independence in 1580 to the reform of the Portuguese Universities in 1772, when the first faculty of mathematics was created. This view remained unchallenged until the 1940s. In his contribution, Luís SARAIVA analyzes the ways in which Portuguese historians of mathematics have given account of this "decline period", and how they saw the Society of Jesus and its mathematicians in that period. For this, the writings of the main Portuguese historians of mathematics are considered, from Stockler's initial essay, where he correctly identifies the Society's main mathematicians in that period, to Rodolfo Guimarães (1866–1918), who in his *Les Mathématiques en Portugal* gives a list of seventeen Jesuit mathematicians (his 1911 *Supplement II* includes the first mention of Jesuits of the China mission), and Francisco Gomes Teixeira (1851–1933), the best Portuguese historian of mathematics up to 1940, who unfortunately decided to present only an overall overview of the "decline period".

In the research on the scientific practice of the Society of Jesus in East Asia that has developed in recent decades, focus on the Beijing Jesuits has led scholars to consider Macao simply as a point of entry into China, where missionaries studied local languages and received information on their places of destination. St. Paul's, the Jesuit College in Macao has therefore been little studied. Ugo BALDINI gives an account of the documents known today about teaching at

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St. Paul's and outlines the main characteristics of Jesuit teaching in Macao. The role of Macao, as an unavoidable crossroads for all missionaries arriving or departing from East Asian missions as well as for all correspondence between East Asian missions and Europe made the College an important place for scientific production and exchange, independently of the level of the teaching there. The complex question of how complementary material concerning this issue might be located is also discussed.

Among the subjects taught in Jesuits colleges, cosmology — the "Sphere" — was transmitted to China and Japan under various forms. Three essays are devoted to it. HIRAOKA Ryuji analyzes the study of this subject in Japan. He discusses the content and characteristics of the Latin treatise *De Sphaera* composed by the Spanish Jesuit Pedro Gomez (1533–1600), which was used as a textbook by Japanese and European students who were preparing for priesthood in Jesuit colleges in Japan. Then he proceeds to analyze three Japanese works derived from Gomez' *De Sphaera*, namely *Nigi ryakustsu* , *Kenkon bensetsu* and *Nanban unkiron* , showing that their circulation was wider than had so far been assumed.

Henrique LEITÃO and Rui MAGONE are jointly preparing a translation of Manuel Dias Jr.'s (1574–1659) *Tianwenlüe* (1615), a summary of European cosmographical and astronomical knowledge with examples and data adapted or calculated for China and which refers to the Chinese official calendar. It is a text in the tradition of the commentaries of Sacrobosco's *Sphere*, but also the first text in Chinese that presented of Galileo's telescopic observations. Their contributions to the present volume are complementary.

LEITÃO analyzes the context in which the *Tianwenlüe* was written, describing the scientific tradition from which it derives, mainly the *Sphere* literature in sixteenth and seventeenth-century Portugal. He emphasizes that Manuel Dias, although never trained in mathematics in a formal sense, was familiar with advanced topics of astronomy; this suggests that he must have had contact with specialized books and experts in mathematical and astronomical subjects. On this subject some hypotheses are put forward concerning the network of Portuguese Jesuit schools: Coimbra, Goa and Macao. LEITÃO also points out that the cosmological model proposed by Dias differed slightly from that given by Matteo Ricci (1552–1610, the founder of the China mission), with features only included in later editions of Clavius' commentary on the *Sphere*. The *Tianwenlüe* is not simply a translation: it shows traces of its Chinese context. Thus, subjects like solar and lunar eclipses, of crucial importance in Chinese official astronomy, are emphasized in it. Leitão argues that the *Tianwenlüe* marks a new stage in the Jesuit scientific presence in Asia, a change from the initial presenting Western science *to* China to writing Western science *in* China.

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Rui MAGONE analyzes the extant versions of the *Tianwenlüe* that he has so far been able to access, and proposes an interpretation of the differences between these versions. The importance given to the *Tianwenlüe* in the eighteenth century is apparent from the work's inclusion into the *Complete Library of the Four Treasuries* (*Siku quanshu* , 1782), an empire-wide compilation project commissioned by the Qianlong Emperor (r.1736–1795). However the editors of the *Complete Library* not only suppressed Dias' preface (which contained references to the Christian religion, then banned in China) but also truncated the text, omitting the account of Galileo's telescope observations. MAGONE puts forward several hypotheses to explain these omissions; he argues that the work was regarded as relevant for its "use" rather than for its "essence".

Turning to the reception of Western learning, LIM Jongtae examines how a group of mid-seventeenth century Chinese literati at the centre of which was the famous scholar Fang Yizhi (1610–1671), responded to the religious and philosophical implications of the Jesuits' science. The latter was deeply imbued with scholastic philosophy; in fact, Western science as a whole embodied the Christian–Aristotelian vision of the world. Fang's group, which included Xiong Mingyu , Jie Xuan and Fang's son Zhongtong , was exceptionally favorable to Jesuit science. However, LIM argues, major inconsistencies found in some Jesuit texts, where contradictory explanations were provided for the same subjects, convinced those literati that Western knowledge could be wrong. They constructed their own alternatives for what they thought were the shortcomings of both Chinese and Western knowledge. Fang Yizhi attributed one of the main defects of Western knowledge to the obsession with exact measurements, and consequently the neglect of the principles underlying the phenomena. In many of these scholars' arguments, analogical reasoning was combined with data from the observation of natural phenomena, backed by a belief in the unity of the world. In this way, LIM concludes, the overall picture of the universe these scholars presented and the basic methodology they used remained close to those of the Chinese tradition.

Vietnamese science is usually assumed to be an offspring of the Chinese tradition; in fact little known about its actual contents and social function prior to French colonization in the nineteenth century. However, in the seventeenth-century, when the territory was divided between the Trinh to the North ("Tonkin") and the Nguyen ("Cochinchina") to the South, some Jesuit missionaries who worked there under the Padroado provided valuable information. Alexei VOLKOV analyzes the works of several Jesuit missionaries, in particular Christoforo Borri (1583–1632) and Giovanni Filippo de Marini (1608–1682), who give brief accounts of astronomy and mathematics then practiced in the two kingdoms, and offer a glimpse at the way in which Jesuit missionaries employed their scientific expertise

to interact with local authorities. Thus VOLKOV shows that exploration of the Western sources provides interesting and sometimes unexpected answers to questions that had so far found no answer on the basis of the available Vietnamese sources.

Catherine JAMI's contribution focuses on Tomé Pereira (1645–1708), a Portuguese Jesuit who spent most of his adult life in Asia, including thirty-five years in Beijing, as a clockmaker, musician and interpreter in the service of the Kangxi Emperor (r.1662–1722). Pereira wrote a treatise on European musical harmony, a revised version of which was eventually published as part of the imperially commissioned *Lülü zhengyi* ("Exact meaning of pitchpipes", 1723). Despite this, Pereira's role in the circulation of the mathematical sciences is usually assessed as negative. In 1688, when five French Jesuits sent by King Louis XIV as "his Mathematicians" arrived in Beijing, he effectively succeeded in keeping the most skilled of them away from the emperor and from the Imperial Observatory. JAMI analyzes Pereira's motivations: the defense of both discipline in the Society of Jesus and the Portuguese monopoly on Asian missions, to which the French mission was a direct challenge. Thus Pereira is shown to be an interesting counter-example to received ideas concerning science and the Jesuit mission to China: it was his musical talent, rather than any skill in the sciences, that earned him imperial favor; moreover, his case shows that national allegiance could take precedence over the international dimension of the Society of Jesus. This points to the need for a more nuanced assessment of the role of science both within the Jesuit mission and in the toleration of Christianity in early Qing China than has so far been made.

SHI Yunli recounts how Western astronomical knowledge further circulated from China to Korea. In 1742, under the supervision of Ignatius Kögler (1680–1746) and André Pereira (1689–1743), the Beijing Bureau of Astronomy published a new work on calendrical astronomy, the *Yuzhi lixiang kaocheng houbian* ("Later volumes of the thorough investigation of calendrical astronomy imperially composed"). While retaining the Tychonic model, this work introduced Newton's theory of the moon and a number of other developments in predictive astronomy in Europe, including Kepler's first two laws of planetary motion. A year later, Korean emissaries returning from a diplomatic mission to Beijing brought two copies of the work back to the Korean court. A royal astronomer was immediately dispatched to Beijing to learn the new system, and returned in 1744. In the following century and a half, the system explained in the *Yuzhi lixiang kaocheng houbian* remained the core of official astronomy in Korea. Four famous Korean astronomers in the period based their own works on it. In a detailed review of these works, SHI shows how the new theory was received in Korea, and how astronomers accommodated it with the older theory that they had previously adopted from official Chinese sources.

It is our hope that the present volume will contribute to the growing field of study of the circulation of knowledge between both ends of the Eurasian continent in the early modern age. The essays in it represent a variety of approaches: reflection on historiography, unearthing of new sources, as well as closer analysis and confrontation of those already known to us. The material thus used is revealing regarding not only the actors of this circulation, but also their gaze on each other's knowledge, practice and beliefs. New light is thus shed on the Jesuit educational network in East Asia, on the production and circulation of Jesuit works in Japan and Korea as well as China, on the reception of Western learning in its qualitative as well as its quantitative dimension in those countries, on state patronage of the sciences, on the latter's role in the missionary enterprise, and on hitherto unknown aspects of East Asian civilizations such as the official astronomy practiced in Vietnam. Thus the mathematical sciences appear to be closely intertwined with a variety of worldviews as well as social practices. We know that there is still a long way to go in the process of grasping the complexities of the cross-cultural circulation of the sciences. It is our aim that the series of international meetings *History of Mathematical Sciences: Portugal and East Asia* should continue to take place regularly, and its proceedings should be further published.

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